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THE RABBIT INVASION.

For many years past the authorities controlling the agricultural industry of this State have been ceaselessly impressing upon farmers and others the importance of using their best endeavours to bring about the extermination of the rabbit pest. Huge sums of money have been expended by Governments past and present in the construction and maintenance of substantial fences, covering hundreds of miles of country, designed to hold back the invasion that threatened the agricultural and pastoral development of the State. Sheaves of literature have been freely distributed, and expert advice from those who have studied the problem in all its aspects and familiarised themselves with the habits and haunts of the rodent has been broadcasted throughout Western Australia *per viam* the press and Departmental Bulletin. Unfortunately it would be vain to say the results achieved have realised anticipation, and there is evidence that in some cases failure to appreciate the immensity of the danger led to slackness and lack of co-operation. Vermin Boards have been appointed with power to enforce the work of destruction, and inspectors and boundary riders have been urgent in their efforts to ensure as far as possible immunity from the trespassers, but the conclusion is forced that some sinister influence interfered to defeat the objective. Five years ago, although rabbits were not numerous in any particular district, it was known that they were to be found all over the area west of the No. 2 fence, and whilst many there were who earnestly strove to rid their properties of the pest, some treated their warning notices with any airy insouciance fatal to any organised attempt at complete destruction. How far these nuclei are responsible for the present day position can only be conjectured, but certain it is the rabbit has increased enormously, and is here, not in negligible numbers that can afford to be treated unconcernedly, but in a horde that demands vigorous and determined assailment if the farmers are in future to reap the benefit of their toil and industry.

In the last annual report of the Chief Inspector, Mr. Craig, it is gratifying to observe that the menace is more seriously recognised by agriculturists. "Rabbits are still making headway," he writes, "and the outstanding feature has not been the damage they have done in any one locality, but the manner in which they have spread throughout the State. . . . In all the farming districts the Vermin Boards have done greatly improved work, and in the worst infested areas are taking a real and just view and are forcing delinquent settlers to poison during the summer months and give greater attention to fumigation during the winter. In the past 12 months 180 tons of phosphorous poison were distributed."

Just how much loss can be accomplished by rabbits is not always fully recognised, and there are those who believe they represent the foundation of an industry that could be developed into tangible advantages. Reflection, however, will bring the conclusion that this could only be brought about by the sacrifice of far greater industrial enterprises It is estimated that eight rabbits consume the sustenance of one sheep. Does the value of eight rabbits represent anything like that of one sheep? But it is not only the consumption of natural fodder that makes the pest so objectionable, for apart from his depredations on the growing crops, wherever the rabbit thrives he leaves a pasture nauseating to the farm stock. Horses and sheep are particularly sensitive in this respect, and greatly handicapped when pastured in the vicinity of rabbit warrens.

From an industrial point of view bunny is scarcely worth more than momentary consideration. During the five years covering 1919 to 1923 the export from the Commonwealth of frozen rabbits and hares amounted to 27,801,595 pairs, valued at £2,233,118, whilst skins to the extent of 491,429 cwt. of £8,700,252 value were sent away. Over the same period 132,979 sheep and 1,152,813,843 lbs. of frozen mutton and lamb, having a value of £15,132,271; sheepskins worth £10,012,963, and wool which realised £232,132,931, were supplied by Australia to the overseas markets. It is readily seen, therefore, that over this quinquennium the value of the two industries is hardly worthy of comparison. Where one has yielded ten millions the other has yielded hundreds of millions. Moreover, whilst wool, the most valuable of the products, is a recurring source of profit, bunny has his hide and carcase to offer for but once its value. But this is to take only the value of our wool industry as against a possible industry in frozen rabbits and skins that might be built up at the expense of inestimable damage to growing crops and despoilment of valuable pastures. There can be raised no logical and valid reason for sparing the scourge. It simply must be exterminated if this is possible of achievement.

In this regard it should be noted that the process of trapping has nothing to recommend it except the few pounds it may bring to the farmer or professional trapper. It has been proved that as a deterrent this method is little less than useless. Quite recently the rural interests columns of

the "West Australian" while reporting the season's prospects drew attention to the fact that at Tammin rabbits were doing a lot of damage to the crops despite the fact that between 30 and 40 trappers were operating there and over 200 dozen rabbits sent away weekly. In the Eastern States, Vermin Departments, Royal Commissions, and Select Committees have found common agreement, after years of experience, that trapping is not only ineffective but is actually harmful, and tends to increase rather than diminish the numbers. The most effective methods yet discovered are poisoning and fumigation, and, as has been stressed in official Bulletins, one month's fumigation will destroy more rabbits than six months of trapping.

Of the many evils against which the farmer has to contend there is none more serious than the depredations of this vermin, and too great attention cannot be given to its elimination. There have of late been appeals for greater co-operation between Vermin Boards and an extended scope for their authority and action. There is certainly no greater need than concerted action on the part of these bodies, and it is for the individual farmer to augument their efforts by resolutely bending to the task of combating the rabbit invasion.

"THE JOURNAL OF AGRICULTURE"

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THE MAKING OF GRASS HAY.

A. B. ADAMS, Dipl.Agric.
Agricultural Adviser, Dairy Branch.

During the 1924 season probably more grass hay was made in the South-West than during any previous year. In some cases, the quality was unfortunately not as good as it might have been, had the growers been fully conversant with all the factors necessary for success. There have been generally only two faults which have caused this lack of quality in the hay, viz.:—

1. *The grass was cut too late.*—It is established knowledge that leaf is more nutritious than stem, and that as a grass plant approaches ripeness the digestibility and productive value of its dry matter diminish; hay made from ripe grass that has lost leaf and seed is merely straw. Early mowing involves some loss of weight and a greater loss of bulk, but the additional weight and bulk obtained by later cutting represent matter of little nutritive value. From English figures (and probably local figures, if available, would give comparatively similar results), hay is not usually as nutritious as pasture grass without water.

100lbs. of the dry matter of pasture grass grown on good soil yields 56lbs. of productive nutriment (starch equivalent), whereas 100lbs. of the dry matter of good hay yields 36lbs. and poor hay 20lbs. of productive nutriment.

A milch cow can extract all the nutriment she requires in a day by consuming about 27lbs. of pasture dry matter.

To obtain the same quantity of nutriment from the good hay above she would require to consume 42lbs., an amount which is beyond her digestive capacity. Very good hay tends to approach in character the dry matter of pasture grass, while poor hay resembles straw.

It has been proved, by feeding trials with dairy cows, that hay made by carefully drying short leafy grass has the same nutritive value as fresh grass.

Cattle-feeders know that a feeding pasture fattens best when the grass is kept reasonably short: if allowed to run up and become stalky, such good results are not obtained. These two facts emphasise the importance of early mowing and suggest the desirability of experimental work, to ascertain whether the increased nutritive value of hay made from two or more cuts of shorter herbage could be secured at an economical cost.

One settler during last season reported that he had cut a portion of his Subterranean clover paddock for green feed in October, obtaining a large amount of feed. On cutting the whole paddock in November, the portion cut in October had caught up to the rest of the paddock. The writer examined the plot and found that there was quite enough seed on the ground to give a good stand the next season.

Although an isolated instance does not prove that the same result will be obtained on all soils, and on the same soil a different result might follow in a different season, nevertheless it certainly suggests the advisability of each farmer cutting a small portion of his clover as soon as it has made sufficient growth. He will thus gain knowledge of value to himself, and if the results are published, of value to his district and the State as a whole.

2. *The crop after cutting was left too long exposed to sun and weather.* —The usual causes of loss in hay-making may be placed under four heads:—

(a) Respiration: The grass does not die immediately after cutting, but continues to respire and consume its cell contents. The loss from this cause in a moist climate has been known to amount to over 10 per cent. of the dry matter of the crop.

The farmer in this State is unlikely to experience sufficiently prolonged moist weather to cause heavy losses from respiration.

(b) Shedding: As a rule there should be no broken leaves to shed. The loss of leaf and other fine portions of the fodder is due to over drying and to rough treatment of the crop.

(c) Leaching: Untimely rain, falling on half-dried grass spread over a large surface, may remove a large proportion of the sugar and the soluble ash constituents of the fodder. Windrows and especially well-made cocks are capable of resisting, to some extent, the action of rain.

(d) Overheating in the stack: Mow-burnt hay contains little digestible carbo-hydrate and the digestibility of its protein is very low. Losses up to 30 per cent. of the nutritive value of the hay have been recorded as due to over-heating in the stack.

From the foregoing it will be realised that to obtain hay of the highest possible feeding value, certain principles must be remembered. In the first place the crop must be cut on the early side; this is especially true if there is any large area to be cut, as if that first cut is approaching maturity the last cut will be over ripe.

If there is a large proportion of Silver and Spear grasses in the herbage early cutting is especially to be recommended, as though they have a fair feeding value when green they are of little value when ripe, and they ripen very rapidly with the onset of warm weather.

Hot dry weather is of advantage, as it kills the grass rapidly and prevents losses from respiration. Once the bulk of the grass is killed, the sooner the crop is run up into windrows and cocks the better, provided that it is not handled when the leaves are brittle. If tender during the heat of the day it can generally be handled safely in the cool of the evening, or first thing in the morning.

In this State we are unlikely to get sufficient rain to cause leaching; loss is far more likely to be caused by overlong exposure to a hot sun and dry winds.

Loss from both these causes may be prevented by running up into cocks as early as possible.

Over-heating in the stack is most unlikely to happen if the hay is allowed to lie in the cock a few days before being carried.

For the conduct of farm operations in general and for hay harvesting in particular recipes can be of only very limited service, applicable only under certain conditions. It is otherwise with principles, an understanding of which enables the farmer to adapt his methods to his varying circumstances and requirements, and to draw more valuable lessons from each season's experience.

Many farmers had difficulty last season in cutting the grass crop with the mowing machines in their possession, grass and clover being far more difficult to cut than a cereal crop.

The following remarks on some of the common difficulties of mowing machines are from the "Journal of the British Ministry of Agriculture," April, 1923:—

"Heavy draught is caused by—

"(1) Poor lubrication.

"(2) A dull set of knives.

"(3) Non-alignment of the cutter bar.

"The remedies for (1) and (2) are obvious, but the importance of (3) is frequently not appreciated. The cutter bar should work at right angles to the machine when actually cutting; the resistance of the grass frequently causes the bar to drop back a little, and some manufacturers recommend setting the end of the cutter bar forward a distance of about 1½ inches. With the cutter bar working at right angles, the knife, connecting rod, and pitman wheel are in approximately a straight line.

"If the bar drops back and alters the alignment it causes increased friction on the inside shoe parts, and this friction causes increased draught but does not cause side draught, as is often supposed. Non-alignment seldom occurs in machines with under three or four years' service; the majority of modern mowers are provided with methods for adjusting the alignment of the cutter bar. When making the adjustment great care must be taken that the adjustment does not prevent the knife sections registering with the fingers.

"*Uneven cutting and side draught.*—These troubles are due principally to a poorly adjusted cutter bar. It must be appreciated that the principle on which a mowing machine cuts is the same as that of a pair of shears; if the blades are held closely together a clean cut results, but if the blades are held loosely the material wedges and will be pulled and not cut. If at the end or beginning of a thrust by the connecting rod the knife sections do not centre, only a portion of the grass wedged between the fingers will be cut. The remaining grass, which is not cut, but pulled, offers resistance, and is consequently the cause of side draught.

"It will be seen therefore that the causes of above are:—

"(1) The knife sections not being firmly pressed against the ledger plates; and

"(2) The knife sections not centreing with the fingers.

"To correct (1) the attention must be given to the guards, clips, and knife sections. If the guards are out of alignment, the bent ones must be straightened or replaced. Should the clips not be pressed firmly against the back of the knife, the clips should be tapped down gently with a hammer, or replaced. Where both old and new blades are used the clips should be adjusted for the new blades.

"As to (2), one of the main reasons why on some machines accurate centreing does not take place is that the drag-bar is sometimes altered to bring the cutter-bar more forward. This alters the position of the whole cutter-bar in relation to the knife. The remedy is to adjust the drag-bar. A second reason for non-registering lies in the use of a pitman connecting-rod, which is either too long or too short. This latter trouble is not likely to arise in machines with iron connecting-rods.

"Side draught is not so much a matter of width of cut as of properly adjusted parts."

CALCULATING THE WEIGHT OF HAY STACKS AND THE CAPACITY OF TANKS AND DAMS.

Geo. L. Sutton,
Director of Agriculture.

In order to calculate the weight of hay in a stack it is necessary to determine its volume or cubic contents, and also to know the space occupied by a given weight of hay, say a ton, or to have some data from which this latter information can be calculated.

With regard to this latter requirement it should be noted that the weight of hay occupying any given space is not constant, but depends upon a number of different factors, the principal of which are:—

(1) The character and condition of the hay.
(2) The size of the stack.
(3) The age of the stack.

The weight of a cubic foot of hay in different stacks will probably vary, but experience will supply the information required in connection with a particular kind of hay and type of stack, and in this connection, as the result of experience, the schedule hereunder showing the number of cubic feet required to weigh one ton of hay has been adopted for insurance purposes, and is considered to be satisfactory for average Western Australian conditions:—

Number of cubic feet per ton of Hay.

	Oaten Hay.		Wheaten Hay.	
	Sheaf.	Loose.	Sheaf.	Loose.
Immediately on completion of stack ..	350	400	400	500
One week after completion	325	375	375	450
One month after completion	300	350	350	400
Twelve months after completion ..	300	325	350	400

In the event of the data in the schedule being considered unsatisfactory, in some particular case, and in the absence of experience, very definite and accurate information in connection with any stack can be obtained by cutting out a rectangular truss of hay from about midway between the eaves and the ground. By carefully measuring and weighing the truss, the weight per cubic foot can be ascertained.

For calculating the volume of a hay stack a short method quite commonly adopted, and which may be called the "average" method, is to multiply the average length by the average width, and the result by the average height.

The average length and width is ascertained by measuring the length and width of the stack midway between the ground and the eaves, and the average height by finding the height from the ground to the eaves, and then adding to this half the height between the eaves and the ridge.

This method is only accurate when the ends of the stack are vertical, so that the length and width of the stack is the same at the ground level as at the eaves, and when the ends of the roof are not "hipped" or sloping. Such

a stack would be as in Fig. 1, and is the kind usually found in a hay shed, and rarely, if ever, in the field. The length and width of this stack being the same at the ground as at the eaves, the dimensions at these places would also be the average. In this case the average height would be 17 feet, this being found by adding the height from ground to eaves, viz., 12 feet, to half the height of the roof, viz., 10 feet, *i.e.*, 12 feet + $\frac{10}{2}$ = 17 feet.

In accordance with the above rule the volume of such a stack would be, therefore—Length × width × average height = 51 feet × 30 feet × 17 feet = 26,010 cubic feet.

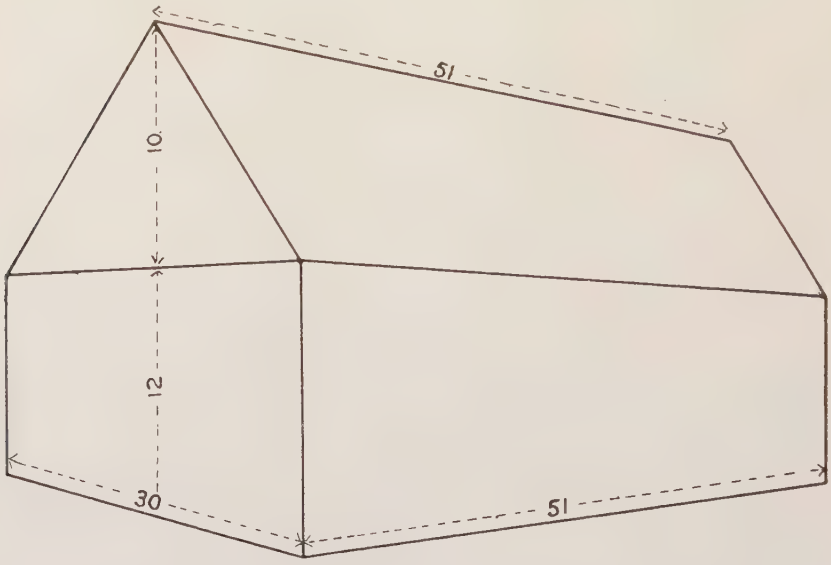


Fig. 1.

Having obtained the volume of the stack, and having decided upon the space which it is considered will be occupied by a given weight of hay, *e.g.*, that 350 cubic feet weigh one ton, its tonnage is determined by dividing the total volume by the number of feet referred to, thus: 26,010 ÷ 350 = 74 tons approximately.

Practically all stacks built in the open are longer and wider at the eaves than at the ground, and many of them have their tops built with sloping ends as in Fig. 2. Though the "average" method already illustrated is a good rough and ready approximation, it has the disadvantage that it is not quite accurate. To secure accuracy it is necessary to use another method which is longer, but not very much more difficult. It requires that the volume above and below the eaves be calculated separately and then added together. The rules for finding the volumes of stacks according to this method are based upon the formula that the volume is equal to the sum of the areas of the top, bottom, and four times the middle area added together, then multiplied by the height, and the product divided by six.

This formula has the advantage that, in addition to being accurate, it can be used for calculating the contents of any figure, providing the top is parallel to the bottom, and that their edges are connected with straight lines. It is, therefore, also useful for calculating the volume of circular stacks, stone-heaps, and embankments, and for determining the capacity of excavated tanks with sloping sides.

The stack illustrated in Fig. 2 being rectangular, the area of the bottom is found by multiplying the length by the width; the area of the top will be found in a similar manner, and four times the middle area will be found by adding the length at the bottom to the length at the top, and multiply-

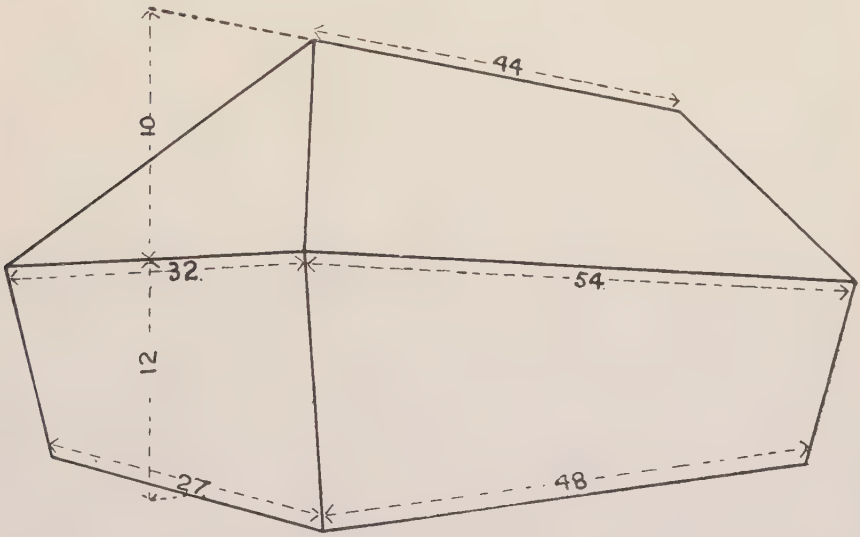


Fig. 2.

ing this by the result of adding the widths at the top and bottom together. In accordance with the above formula the rule for determining the volume below the eaves will be—

(a) Multiply length at ground by width at ground.
(b) Multiply length at eaves by width at eaves.
(c) Add length at ground to length at eaves, and multiply the result by the sum obtained by adding the width at ground to the width at eaves.
(d) Add (a), (b), and (c) together, multiply by the height, and divide by six.

The rule for finding the volume above the eaves, and also adapted from the formula already given, will be—

(a) Multiply the length at the eaves by the width at the eaves.
(b) Add length at eaves to length at ridge, and multiply by width at eaves.

(c) Add (a) and (b) together and multiply by the height, and divide by six.

To find the volume of the stacks similar to those illustrated in Fig. 2, it is necessary, therefore, to have the following dimensions:—

Length and width at the ground.

Length and width at the eaves.

Height from ground to eaves.

Height from eaves to ridge. (The perpendicular, not the slant height, is required.)

Length at ridge.

By applying the rules given, to the dimensions shown in Fig. 2, it will be found that the volume of the stack is—

(1) Volume below the eaves—

a. Length at ground × Width at ground	48 × 27 =	1,296
b. Length at eaves × Width at eaves	54 × 32 =	1,728
c. Sum of lengths × sum of widths	102 × 59 =	6,018
a + b + c		9,042
d. a + b + c × height ÷ 6 = $\frac{9042 \times 12}{6}$ =		18,084

(2) Volume above the eaves—

a. Length of eaves × width at eaves ...	54 × 32 =	1,728
Length at ridge	44	
b. Sum of lengths × width at eaves ...	98 × 32 =	3,136
a + b		4,864
c. a + b × height ÷ 6 = $\frac{4864 \times 10}{6}$		8,106

(3) Total volume—

(1) Volume below eaves	18,084
(2) Volume above eaves	8,106
Total volume	26,190

As all the dimensions are in feet the volume will be in cubic feet.

Had the volume of this stack been calculated by the "average" method, the result would have been:—51 × 29½ × 17 = 25,576, a difference of 614 cubic feet.

Assuming that the weight of hay in this case has been found to be 6½ lbs. per cubic foot, then the weight of the hay in the stack would be 26,190 × 6½ = 170,235 lbs. = 76 tons.

In calculating the volume of circular stacks it is essential to know that when the circumference of a circle or the distance round it is known, the area of the circle is found by multiplying this distance by itself, and then by seven and dividing by 88.

Because of this, and by the application of the original formula, the rules for calculating the contents of circular stacks, as illustrated in Fig. 3, are—

(a) Multiply the distance round the bottom by itself.
(b) Multiply the distance round the eaves by itself.
(c) Add the two distances together, and multiply the result by itself.
(d) Add (a), (b), and (c) together, and multiply the result by $\frac{7}{88}$, then by the height from the ground to the eaves, and divide by six.

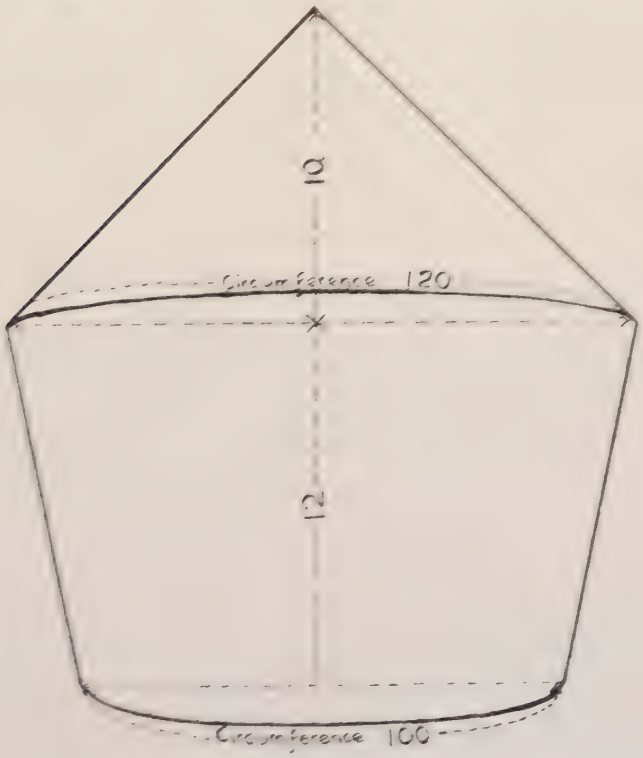


Fig. 3.

Similarly the volume above the eaves is found by multiplying the distance round the eaves by itself and then by $\frac{1}{11}$, and the result by $\frac{1}{3}$ of the perpendicular (not the slant) height from the eaves to the peak.

The dimensions necessary for calculating the contents of a circular stack are, therefore—

(a) The distance round the stack at the bottom.
(b) The distance round the stack at the eaves.
(c) The perpendicular height from the ground to the eaves; and
(d) The perpendicular height from the eaves to the peak.

Having obtained these dimensions, as shown in Fig. 3, the volume of such a stack will be—

(1) Below the eaves—

a. Distance around bottom × distance round bottom $100 \times 100 = 10{,}000$

b. Distance round eaves × distance round eaves ... $120 \times 120 = 14{,}400$

c. Sum of distances × Sum of distances ... ... $220 \times 220 = 48{,}400$

a + b + c 72,800

d. a + b + c × $\frac{7}{88}$ × height from ground to eaves ÷ 6 =

$72800 \times \frac{7}{88} \times 12 \times \frac{1}{6}$ ... ... = 11,582

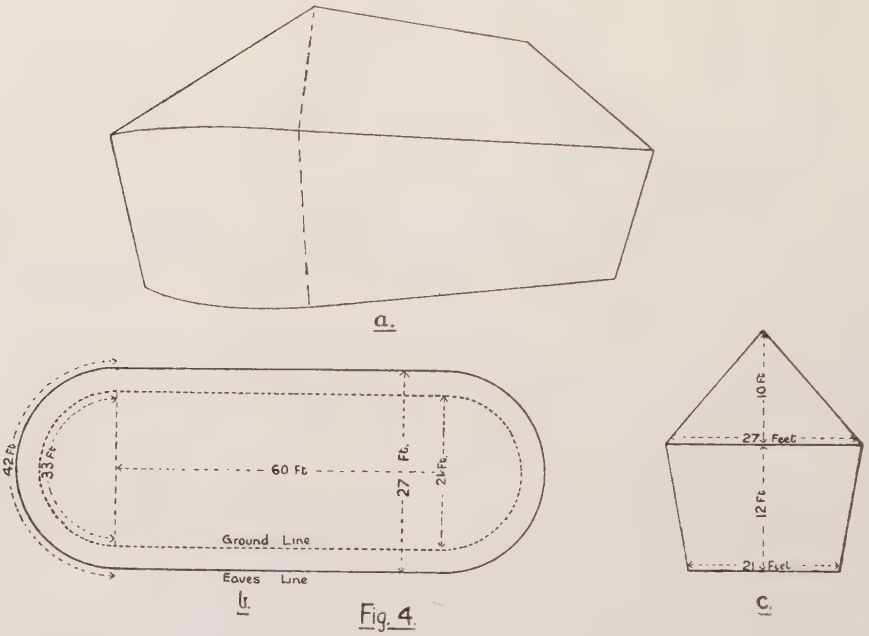


Fig. 4.

(2) Above the eaves—

Distance round eaves × distance round eaves × $\frac{7}{8\frac{1}{3}}$ × height ÷ 3 =

$120 \times 120 \times \frac{7}{88} \times \frac{10}{3}$ ... ... = 3,818

(3) Total volume—

(1) Contents below eaves	11,582
(2) Contents above eaves	3,818
Total contents	15,400

As all the measurements are in feet, the contents are in cubic feet.

Another kind of stack occasionally built is one with semi-circular ends, as illustrated in Fig. 4a, with plan and a vertical end section at the junction of the circular and other portion of the stack, in Figs. 4b and 4c, respectively. From an examination of these illustrations, and by imagining that the stack would be divided vertically by a huge knife so that the circular ends were separated from the central portion, it will be seen that for the purpose of finding its volume, such a stack can be divided below the eaves

into a central rectangular portion with straight ends and sloping sides, and two semi-circular end portions which, if placed together, would form a body similar in shape to that part of a circular stack found below the eaves. Above the eaves it will consist of a central wedge with straight ends, and a cone formed from the two half cones, one at each end.

In accordance with the methods already followed in connection with the calculations of the contents of the rectangular stack, shown in Fig. 2, and the circular stack in Fig. 3, the contents of the circular ended stack, as illustrated in Fig. 4 will be—

Below the eaves—

(1) Central rectangular portion—

a.	Length at ground × width at ground	= 60 × 27 =	1,620
b.	Length at eaves × width at eaves	= 60 × 21 =	1,260
c.	Sum of lengths × sum of widths	= 120 × 48 =	5,760
	a + b + c ... ... =		8,640
d.	$a + b + c \times \text{height} \div 6 = \frac{8640 \times 12}{6}$		17,280

(2) Two semi-circular ends—

a.	Distance round bottom (2 ends) × distance round bottom ... ... =	66 × 66 =	4,356
b.	Distance round eaves (2 ends) × distance round eaves... ... ... =	84 × 84 =	7,056
c.	Sum of distances × sum of distances ... ... =	150 × 150 =	22,500
	a + b + c		33,912
d.	$a + b + c \times \frac{7}{88} \times$ height to eaves $\div \frac{1}{6}$ 33912 × $\frac{7}{88}$ × 12 × $\frac{1}{6}$		5.395

Above the eaves—

(3) Central wedge-shaped portion—

a.	Length at eaves × width at eaves	= 60 × 27 =	1,620
	Length at ridge	= 60	
b.	Sum of lengths × width at eaves	= 120 × 27 =	3,240
	a + b		4,860
c.	$a + b +$ height $\div 6 = \frac{4860 \times 10}{6}$		8,100

(4) Two half-cone sections—

Distance round two sections at eaves × distance round two sections at eaves × $\frac{7}{88}$ × height ÷ 3 = 84 × 84 × $\frac{7}{88}$ × $\frac{10}{3}$ 1,871

Total volume of stack—

(1)	Volume below eaves, Central portion	17,280
(2)	,, ,, ,, (2) Semi-circular ends	5,395
(3)	,, above eaves Central portion	8,100
(4)	,, ,, ,, 2 conical ends	1,871
	Total contents	32,646

As all measurements are in feet, the contents are in cubic feet.

Assuming this to be well settled oaten hay in sheaves with one ton occupying 300 cubic feet, its tonnage would be approximately 108 tons.

Dams, Embankments, and Stone-heaps.

The method used to find the volume of the lower part of the rectangular haystack, illustrated in Fig. 2, can be used to ascertain the quantity of earth received when excavating a tank, as in Fig. 5. The same rule can also be used for ascertaining the quantity of material contained in embankments, stone-heaps, etc. The dimensions required for the purpose being the length and width at top and bottom and the vertical height.

In the case of the excavated tank, illustrated in Fig. 5, the volume of earth removed would be—

a.	Length at bottom × width at bottom	= 30 × 9 =	270
b.	Length at top × width at top	= 126 × 89 =	11,214
c.	Sum of lengths × sum of widths	... 156 × 98 =	15,288
	a + b + c		26,772
d.	a + b + c × depth ÷ 6 = 26772 × 16 × $\frac{1}{6}$	=	71,392

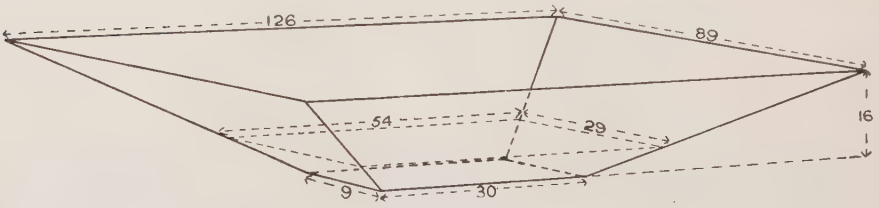


Fig. 5.

As all measurements are in feet, the contents are in cubic feet, and to reduce these to yards it is necessary to divide by 27, thus making the capacity in cubic yards = 2,644.

As a cubic foot will hold 6¼ gallons, or a cubic yard 168¾ gallons, the capacity of such a tank when full can be determined by multiplying its contents, if in feet by 6¼, or if in yards by 168¾.

The amount of water in a partially-filled tank can be determined in a similar way after ascertaining the vertical depth of the water and the dimensions of the tank at water level. Thus, in Fig. 5, the water level is indicated by the dotted line, and is assumed to be four feet from the bottom of the tank. The dimensions of the tank at this level are readily found when the batters are known, or are determined from the top and bottom dimensions of the tank. At the water level shown they will be—length 54 feet, width 29 feet, and the capacity of the tank at the water level will, therefore, be—

a.	Length at bottom × width at bottom	= 30 × 9 =	270
b.	Length at water level × width at water level	= 54 × 29 =	1,566
c.	Sum of lengths × sum of widths	= 84 × 38 =	3,192
	a + b + c		5,028

d. $a + b + c \times \text{depth} \div 6 = \frac{5028 \times 4}{6} = 3{,}352$ cubic feet.

As there are 6¼ gallons in a cubic foot, the quantity of water in the tank is, therefore, 3,352 × 6¼ = 20,950 gallons.

THE SCIENCE OF COOKERY.

FOREWORD.

Most farmers' wives are justly proud of their domestic and culinary attainments, yet in these days of progressive land settlement there must be many of the younger order starting a new phase of life unequipped with the qualification and experience necessary to this important branch of their duties. Altogether apart from these, however, at country demonstrations given annually by the Inspectress and Organiser of the Domestic Science Classes it has been made clear that the wisest are those who seek further wisdom, and the experienced housewife has invariably evinced a pleasing and appreciative interest which has been followed by written requests for more information. By arrangement with the Education Department the Journal has secured a series of articles from the pen of Miss M. A. Wylie, the first of which appears in this issue, dealing with the science of cookery, and is submitted with the firm conviction that this new departure will appeal to the lady readers of these pages. It is not intended to confine the scope of these articles to this one subject, and as far as possible household hints and useful knowledge will be disseminated.—ED.

Miss M. A. WYLIE,
Inspectress and Organiser of Domestic Science Classes.

Some women are born to be cooks; some achieve the art by long and arduous practice; some never try to cook, and others, when they do attempt it, have but little success. At some time in life, however, almost every woman has cooking to do, or she is called to superintend or pass judgment upon the cooking of others; hence knowledge of the subject is essential to all.

Cooking is a means of bringing about certain chemical changes in foods, rendering them more tender and easier of digestion; it is a means of making foods more palatable, and of producing certain appetising dishes with distinctive flavours; but if there is ignorance of the principles of cookery, the food value is lost and the desired changes do not take place.

The first point to consider is the value of the food substances used. These may be briefly classified according to the particular part they play in the nourishment and maintenance of the body.

Meat contains albumen, which is flesh-forming material.
Fish contains gelatine, which is flesh-forming material.
Eggs contain albumen, which is flesh-forming material.
Milk contains casein, which is flesh-forming material.
Flour contains gluten, which is flesh-forming material.
Peas and beans (pod vegetables) contain legumen, which is flesh-forming material.
Flour contains starch (as well), which is heat and energy producing.
Grains contain starch, which is heat and energy producing.
Meals contain starch, which is heat and energy producing.
Sugar of milk, fruit etc., fats of animals, nuts and butter, are heat givers.

In all fresh foods, especially in milk, fruit and vegetables, the Vitamines known as A, B and C are found. These may be considered as the living elements, the presence of which acts as a preventive to various diseases of the skin and body, and assist in the growth of cell tissue.

The science of cookery not only aims at preserving the value of the food substances tabulated, but at breaking down and softening the fibrous network and walls of the cell that contain them. These objects are achieved by heat, either moist or dry, for heat at various temperatures effects changes in food. Water boils at 212° F., when it bubbles; fat, at 360°-400° F., when a blue fume rises—bubbling fat indicates the presence of water, which should be eliminated; albumen hardens at 212° F., and at that stage is indigestible. Thus, foods containing albumen should never be allowed to reach boiling point either in oven or water. It is a well-known fact that the white of an egg—almost pure albumen—when exposed to long and great heat becomes tough and horny. This is particularly noticeable in the edges of an over-fried egg. It should always be remembered that the shell of an egg only protects the albumen from hardening, through contact with heat, for from 2½ to 3 minutes; after that time the heat penetrates and affects the texture.

The old axiom, "stews boiled are stews spoiled," is a good one, and capable of infinite application.

Custards boiled are custards spoiled,
Soups boiled are soups spoiled.

Meats boiled (after first 10 minutes) are meats spoiled, as these foods are chiefly albuminous and flesh-forming, which are hardened if exposed to 212° F. Proper care in cooking can make meat tender; improper cooking can make meat tough. Again, foods containing starch, such as flour, rice and cornflour, require boiling or steaming to burst their starch cells. This is noticeable in the thickening of a white sauce. It should therefore be noted that—

Boiled puddings should be kept boiling,
Steamed puddings should be kept steaming,

until the starch cells throughout the mixture are cooked and the puddings removed from the moisture. Steam is the gaseous state of boiling water. Vapour is not steam, but moisture rising from water by means of condensation. It takes longer to steam food than to boil it, as in boiling it is in direct contact with the water.

This article will simply introduce a series dealing with the various methods of cookery, and will briefly treat with the cooking of meats.

The Cooking of Meats.

Red and white meats are composed of bundles of fibrous tubes which contain the albumens or food juices. If cut these juices are apparent and begin to ooze out and, coming in contact with the outside air, coagulate on the surface. The principles to be observed in meat cookery are—

First: That cold water opens and softens the fibres of meat and allows the juices to escape. (Experiment.—A glass of cold water containing a bit of raw meat: note the colouring of the water with the red juices.) For

soups and stews, therefore, the liquid in which the meat is to be cooked must be cold to begin with, and the cooking carried on at a moderate temperature.

Second: That if the juices are to be retained, a coating in some way must be provided to protect the surface of the meat and prevent their escape. In roasting, baking and boiling joints, for instance, the meat should be exposed—as the case may be—to a hot fire, a quick oven, or boiling water, for the first ten minutes. After that the cooking should be carried on at a moderate temperature, when there will be gradual softening of the fibres. During the first ten minutes of great heat the surface albumen becomes hardened to about the thickness of a sixpence, thus forming a casing to keep in the juices.

In shallow frying, small pieces of meat should have their surface sealed at once by exposure to boiling fat for a minute on each side and then cooked evenly for 4 or 5 minutes on each side according to the thickness of the piece.

Roasting is really cooking by the direct rays of the fire, as in the olden days, when the joint was hung in front of a fire and allowed to slowly rotate so as to produce even results. Grilling closely resembles this method of cooking, and after exposing the surface of the meat for a minute on each side for the sealing process it should be cooked evenly and turned frequently.

Third: After the weight of a joint has been decided, the time to be allowed for cooking should be considered. For large joints, pork and veal, 20 to 25 minutes to the pound should be allowed, with 20 minutes extra. For a thin piece, poultry and game, 15 minutes to the pound and 15 minutes extra.

With these principles in view the various methods for cooking meats may be easily followed.

To Bake a Joint.

1. Wipe, weigh, and trim the meat.

2. Allow time for cooking.

3. Place on a trivet or meat stand in a baking tin with fat above and below. (If the fat on the meat is plentiful it may not need more.)

4. Place in a hot oven for the first 10 minutes, then either remove to a cooler part of the oven or reduce the temperature.

5. Baste about every 20 minutes; that is, lift up with a large spoon some of the hot fat and pour it over the meat. This prevents the meat from drying and assists cooking.

CODLIN MOTH.

(*Carpocapsa pomonella.*)

L. J. Newman, F.E.S.
Entomologist.

The long period of immunity enjoyed by the fruit industry of this State from the Codlin Moth was broken on the 2nd of April, when this much-dreaded pest was discovered to have established itself in a small orchard in the North Dandalup district, some 40 miles south of Perth.

Adult Codlin Moth.

It is some twenty-three years since the first outbreak of Codlin Moth was recorded in Western Australia. Since then there have been fifteen outbreaks, the last being in the year 1918.

Full grown larva or caterpillar.

It has been stated in the Eastern States that these various outbreaks have not been fresh introductions, but are recrudescences of the original and first introduction. This we assert to be quite incorrect, and if any proof is needed, the fact that it is seven years since the last outbreak is a sufficient answer. It would not be possible for the pest to be present in our fruit areas during this period, and not assert itself, and thus be discovered either by the growers or our field officers. All orchards, markets, and fruit exported are subjected to inspection, thus assuring that if present the pest would be discovered. There is no doubt whatever but that it is re-introduced each time per medium of fruits brought into the State from the Eastern States, where the moth is rampant.

In regard to the introduction of pip fruits, it is well that the offending public responsible for the bringing in of the same should understand that under the Plant Diseases Act of 1914 it is enacted that pip fruits are totally prohibited. Clause 6 reads as follows:—"Prohibit the bringing into the State generally from any other State, territory, or country of apples, pears, or quinces."

It is regrettable that this pest has again made its appearance in the State. We appeal to the public to assist the Department in preventing these outbreaks by submitting entirely to the law, and refraining from bringing any pip fruits into the State. The present outbreak has fortunately been discovered in time, and before it has spread beyond the bounds of the small isolated orchard in which it was found.

The Department has every confidence that it will be dealt with as successfully as in the past, and that the State will again be able to claim perfect freedom from Codlin Moth. These past excellent results have not been achieved without severe restrictions on the marketing of the fruit, the enforcement of orchard sanitation, spraying, and bandaging of the trees. There has also been the constant attention and vigilance of the Entomological and Fruit Industries Staffs.

To this departmental supervision must be added a very important factor which has meant much in our successful efforts against this pest, namely, the hearty co-operation of the fruit growers. Fortunately there has always existed this feeling between the growers and the Department.

It has been suggested that some parasite is responsible for the control of the Codlin Moth in Western Australia. So far, in any of the outbreaks, we have failed to discover a predaceous or internal parasite that would control or exterminate it. In fact the moth has proved to be very virile, and if prompt and energetic measures had not been taken in each outbreak, the State to-day would have been permanently infested throughout its apple areas.

In view of the serious position that will occur should the moth break bounds and become thoroughly established, it is earnestly desired that all fruit-growers and others report at once to the Department of Agriculture any insect which they suspect might be some stage of this pest.

It can be emphatically asserted that in other countries many a fruit-grower's prospects have been ruined by its ravages. The American authorities state of the Codlin Moth that it possesses the reputation of causing greater financial loss to the pip fruit industry than the total of other known economic insect pests of these fruits in that country. The absence of this undesirable insect in our pip fruits has been our proud boast, and is of extreme importance to the apple and pear export industry. Freedom of his orchards from Codlin Moth gives the local grower a distinct advantage over his Eastern competitors.

To check the dissemination of this and other insect pests, the first line of action is the application of prompt and correct measures for its isolation and eradication, and to accomplish this desirable end the Department of Agriculture relies on the active co-operation of the grower.

Summarised, the following points will be found useful in the identification of this pest:—

1. Codlin Moth attacks apples, pears, quinces, and all other pip fruits.

2. In very severe outbreaks other fruits are sometimes found to be attacked.

3. Two or more broods of Codlin Moth make their appearance during the year in this State.

4. The first brood of moths appears with the blooming of the trees.

5. The larvae of the first brood moths generally enter the fruit at the calyx or blossom end. Those of the second and succeeding broods at many other points, such as where two or more fruits are clustered, or the eggs may even be laid on the leaves and twigs.

6. Eighty to a hundred eggs are laid.

7. Eggs hatch in 8 to 10 days.

8. Catterpillar stage in fruit 20 to 25 days.

9. Pupal stage (summer) 18 to 20 days.

10. Life of moth, 20 to 25 days.

Hibernating larvae of Codlin Moth taken under bark during month of May.

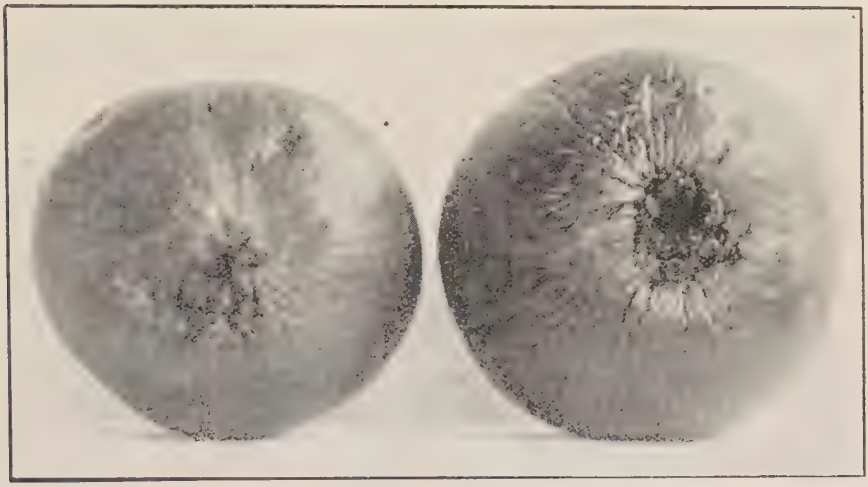
(Original)

11. The last batch of caterpillars in autumn do not at once pupate, but hibernate as larvae within the "cocoon" over winter, transforming into pupae 14 to 16 days before emerging as moths in the spring.

12. Infested fruit can be easily recognised by the brownish moist castings of the caterpillar, generally found in the eye of the fruit, giving it a moist or wet look.

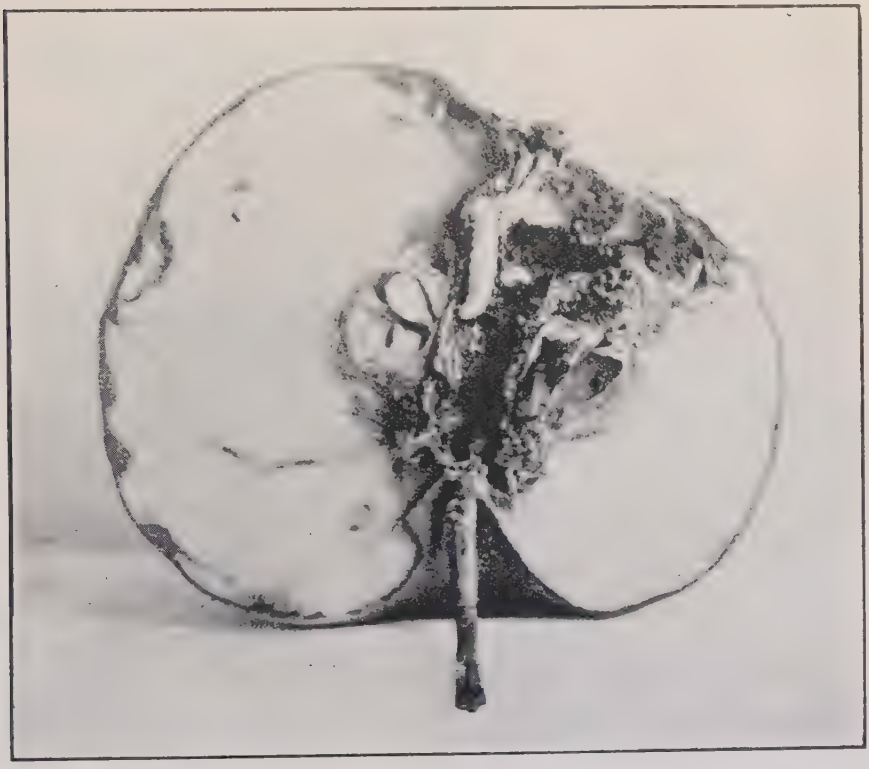
13. The Codlin Moth larva or caterpillar is about half to five-eighths of an inch long, of a fleshy pink colour, and feeds inside the fruit, demolishing the pips.

14. Attacked fruits ripen prematurely and fall.



Apples showing typical castings of Codlin larvae.

(Original)

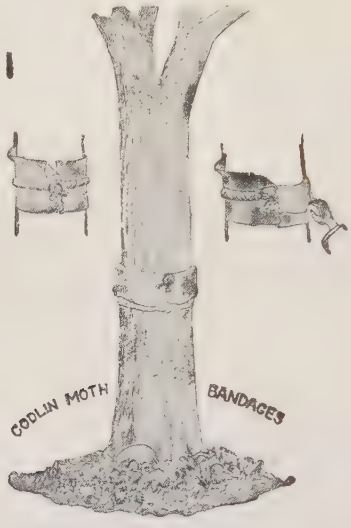


Cut apple showing typical work of caterpillar. Note pips have been consumed.

(Original)

Summary of Prevention.

1. Scrape loose bark from trunk and branches, and clean out all cracks and crevices.
2. Bandage trunks with hessian traps, as shown in illustration, and examine every 10 days.
3. Destroy daily by boiling all infested fruits both on trees and ground.
4. Keep orchard well cultivated and free from rubbish.
5. Keep packing-sheds and store-rooms thoroughly cleaned up and fitted with spring-hinged wire-doors, and windows covered with fly gauze.



Method of tree bandaging for trapping the Codlin caterpillar.

(Original)

6. Avoid the use of second-hand cases, packages, or bags unless previously immersed in boiling water and soda for at least five minutes.
7. Examine tree trunks for caterpillars or pupae to three inches below the ground level.
8. Thin out fruit to prevent clusters.

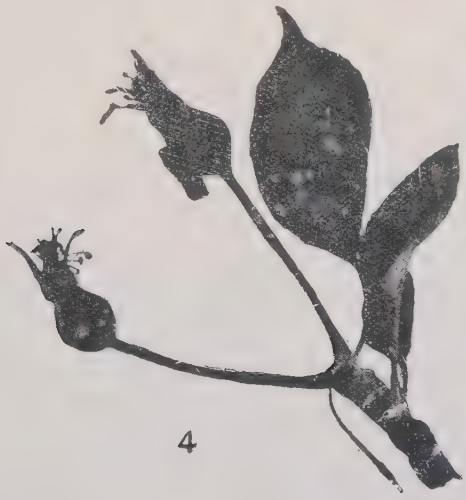
Treatment.

1. Apply first spray just as the petals fall and before the calyx closes, using a coarse nozzle and high pressure.
2. Apply second spray with fine nozzle 10 to 12 days after the first.
3. Third spray follows 14 days later.
4. Fourth spray six weeks after third.
5. Fifth spray 10 to 12 days after fourth.
6. Sixth spray 14 days after the fifth.
7. Should there be a third brood it will be necessary to again spray in March.
8. Arsenate of lead (paste), 2½lbs. or powder form 1½lbs. to 50 gallons of water, is the recommended spray.
9. Use pump with good agitator, maintaining a pressure of at least 90lbs. to the square inch.

10. See that the spray is applied at the right time, and so thoroughly that no blossoms, fruit, or foliage are left uncoated with the poison.

For description of insect and fuller details of prevention and treatment apply to the Department of Agriculture for Bulletin on Codlin Moth.

The above plate was made from a photograph of a flowering specimen of the apple taken immediately after the fall of the petals. The small green lobes which persist after the petals have fallen and are to be seen at the apex of each young fruit, collectively constitute the calyx of the flower. When in this condition the first spray should be applied, as later on the calyx closes over and the young eye of the fruit becomes inaccessible to the spray.



Too late for successful first spring spraying.
Note calyx has closed.

SUDAN GRASS SEED.

W. M. Carne, F.L.S.,
Economic Botanist and Plant Pathologist.

Examination of samples of Sudan Grass seed obtained from various sources during the past summer showed results as under:—

Average of 17 samples—
Purity—96 per cent.
Germination—67 per cent.
Weeds per lb. of sample—82.

In considering the value of seeds for farm sowing the first point to be taken into consideration is the proportion and character of the weed seeds present. Four samples were found to contain noxious weeds. Of these three were traced to a Perth seedsman, whose remaining stock was immediately condemned. These samples contained Thorn Apple and Bathurst Burr seeds.* The fourth sample, which contained Bathurst Burr, was not traced. It is unfortunate that although growers not infrequently complain about the quality of seed purchased, they usually decline to state from whom the seed was obtained. It is not possible to keep a staff inspecting seeds all over the country, or to undertake more than a limited number of seed tests. Farmers will be watching their own interests if they report cases of the suspected selling of noxious weeds in farm seeds.

The number of weeds per pound of sample in the 17 samples examined varied from *nil* to 390. Outside those already mentioned the weeds were of minor importance, being mainly millets, and other edible plants.

The percentage of sound seed varied from 71 to 99 per cent., and the germination of the sound seed from 38 to 89 per cent.

The best basis for the comparison of samples, after considering the weeds present, is by what is known as the "Real Value," which is obtained by multiplying the Purity and Germination percentages and dividing by 100.

Applying this test to five samples obtained from Perth seedsmen in March of this year we get some interesting results:—

——	Purity.	Germination.	Real Value.	Quoted Price.
				per lb.
Sample A	99·4	81	81	6d.
„ B	96·8	38·7	38	6d.
„ C	98·8	51	50	6d.
„ D	84·8	58·5	50	7d.
„ E	71·2	74·0	53	8d.

If sample A was worth 6d. per lb., the values of the others would be B 3d., C and D 3¾d., and E 4d. per lb. If sample B was worth 6d. per

* Illustrated in March and June issues of this "Journal."

lb. the values of the others would be A 12½d., C, D, and E 8—8¼d. per lb. It is obvious that a considerable variation in quality occurs, and that a farmer may suffer considerable crop loss by purchasing seed of low quality. The seedsman cannot be relied upon entirely, nor even the prices quoted. It is to be feared that seedsmen's prices are based more upon buying costs and competition with other firms than upon quality. As a matter of fact the best sample came from the same seedsman as the condemned seed containing Thorn Apple and Bathurst Burr. That latter had, if the weeds were ignored, a Real Value of 62 as against 81 for the good seed.

Under the Agricultural Seeds Act farm seeds are required to be sold with a guarantee of germination and purity. The guarantees given by seedsmen at present are for the most part so low as to be worthless. They will naturally continue to give these low guarantees until such time as the farmers demand high quality seed and are prepared to pay for it. So long as farmers remain content to purchase seed which the vendor will only guarantee as poor, no great improvement in the quality of seed sold can be expected.

A useful feeding trough improvised from old petrol tins by Mr. G. C. Spencer, Grass Valley.

HORTICULTURAL NOTES.

Geo. W. Wickens,
Officer in Charge Fruit Industry.

SEASONAL WORK FOR OCTOBER, NOVEMBER, AND DECEMBER.

October.

Every attention must be paid to cultivation during this month. Where the orchardist's work is up to date, plouging and cross-ploughing will have been completed in September, and the cultivator must be continually in operation during October. Should rain fall after the land has been worked down, cultivation should be proceeded with again as soon as it dries out sufficiently to enable the tools to be used without making the soil sticky.

In our fruit-growing districts generally, the winter rainfall has been below the average, but there has been an ample supply for most varieties of fruit if care is taken to conserve the moisture in the soil by thorough cultivation. The pieces of land around the trees which cannot be readily moved with the plough and cultivator should not be left untouched, but should be freed from weeds and loosened with a digging fork or pronged hoe.

In orchards which have been planted out this season special attention must be given to hoeing around the young trees, and this must be carefully done so as not to disturb the roots.

Spraying operations for control of Black Spot of pears (*Ventura pirina*), as set out in the September "Journal," should be carried out this month where necessary.

Powdery Mildew, which has become quite a serious disease on several varieties of apple trees during the last few years, needs attention this month. "Rome Beauty," "Cleopatra," and "Jonathan" are amongst the worst infected, and in orchards where these suffered in the past season they should receive a spraying with atomic sulphur, using 1lb. of atomic sulphur in 10 gallons of water, just after the blossom petals have fallen.

Orange Aphis will be making its presence felt in the citrus groves, and should be sprayed with Black Leaf 40 and soap.

Fruit Fly in the infested districts will be depositing her eggs in the early ripening apricots and peaches before the end of this month, and these, as well as loquats and citrus fruits, require constant attention in baiting and destruction of infested fruits.

White Wax Scale (*Ceroplastes ceriferus*), which has been present in some of the orangeries in the Kalamunda district for some years past was, this year, found by Mr. Read, the Orchard Inspector for that district, to have turned its attention to two native plants—one the Christmas Tree (*Nuytsia floribunda*), which was only slightly infested—the other a shrub (*Sollya fusiformis*), common name "Bluebell," which the scale lives and thrives upon quite as well as on citrus trees. This is the first time that Wax Scale has been reported on native plants in Western Australia, and it behoves all growers whose orange trees are infested to make certain that no

hosts outside the orchard are carrying on the pest. White Wax Scale can be controlled in the citrus groves by spraying with diluted washing soda, but the infested native plants should be grubbed up and burned forthwith.

There is one thing particularly I would like to urge upon all growers, and that is to keep a vigilant watch during the spring and early summer months for signs of Codlin Moth in the apples and pears, and report to this Department at once any indication of the unwelcome stranger. All those who are commercially interested in fruit-growing will have read with interest and some apprehension the reports which were published in the press last summer advising that this most-feared insect pest of the apple-growers has once again found entrance into the State. The last visitation was in 1918 at Caversham, near Perth, and the one before that was in 1914 in Bridgetown. The Bridgetown outbreak possessed the most serious features of any that has occurred concerning the possibility of the moth making a permanent home in the State: for the infested orchard was situated in one of the best apple districts, and within a three-mile radius there were 1,100 acres of apple and pear orchards: but with the whole-hearted co-operation of the growers concerned the infestation was controlled in one year, and the district has been free ever since. The present outbreak is at North Dandalup, and unfortunately was not discovered until a fair proportion of the fruit in the orchard had been marketed, so growers will understand why I am stressing the necessity of vigilantly watching for traces of the pest, and reporting anything suspicious at once.

It is quite possible that some of the apples marketed before the infestation was known may have contained Codlin larvæ, and the moths resulting from these may have found their way into apple orchards in districts far remote from North Dandalup. But what was done at Bridgetown can be done in any other part of the State, provided the pest does not obtain too long a start in the race. In the interests of the apple and pear industry of Western Australia it is essential that every grower should devote time to searching for traces of Codlin, and report at once anything that looks suspicious.

November.

Continue cultivation.

Continue baiting for fruit fly and destruction of infested fruit.

Woolly Aphis will show up in quantities this month unless controlled by parasites or spraying: where parasites are not present spraying must be resorted to, or the pest will destroy the young buds and materially interfere with the crop of fruit to be harvested.

Spray for Pear Slug this month, using 2½lbs. arsenate of lead in 50 gallons of water.

This is the month when thinning of fruit commences, and I think it will perhaps serve a useful purpose to reprint my notes on this operation which were published in the "Journal" of September, 1924:—

The first of the new season's stone fruits will ripen this month in the warmer districts: "Edward VII.," "Bell's November," and similar varieties of peaches being fit for gathering before the 30th. These varieties, if not well grown, are very poor in quality and appearance, and winter pruning

should have been done with the idea of restricting the trees' production by the removal of a large proportion of the fruiting wood: but no matter how carefully and well winter pruning is carried out, it will be found in a normal season that thinning the young fruits is essential if size and quality are to be obtained. This refers not only to the fruits above mentioned but to the major portion of the kinds of fruit now being grown, and I know of no single operation in the work on the orchard that is so generally neglected as thinning out young fruits, nor one that pays better when it is efficiently done. Fruit is sold by the pound or case in Western Australia, and just as many pounds or cases will be gathered from a tree that has been judiciously thinned as from one that has been allowed to overcrop: one fruit on the thinned tree equalling in size and weight two, and sometimes even three, on the tree that has over-cropped. But quite apart from the fact that the quantity harvested is nearly the same, the large-sized, good quality fruit will always find a market and command a price where the small, hard fruit lacking in juice and appearance is difficult to dispose of at any price.

In thinning stone fruits—peaches, apricots, and plums—the operation should be delayed until the natural shedding has taken place. If it is done before, many fruits will be removed by hand that would have fallen naturally. The shedding mentioned will be finished with nearly all varieties early this month. No hard and fast rule can be laid down as to the number to take off: the usual advice with peaches and apricots is to space the fruits to about four inches between them, but the trees rarely fruit evenly enough to allow of this being made an absolute rule. However, they should be thinned so that room is allowed each fruit to develop to the full size for the variety without touching its neighbour, and when the fruit is borne on lateral, willowy growths as distinct from short stiff shoots, care must be taken not to allow more weight of fruit at the ends than the wood can carry.

Apples and pears grow in clusters, at times as many as five together, and according to variety these should be thinned to one or two in each cluster. In dealing with small varieties of apples, such as "Yates," especially where fruiting spurs have been developed right throughout the tree, one apple in each cluster is enough to leave: with "Dunn's" this would result in the fruit being too large, and two in each cluster may be left, provided, of course, the clusters are not too close together. Judgment must be exercised in thinning "Cleo.'s" sufficient always being left on the trees to prevent the fruit becoming over-sized, for where this happens Bitter Pit is sure to follow. "Jonathan's" must not be thinned too heavily, or the fruit will grow large and sappy, and its keeping qualities be spoiled.

For the grower who is a novice at thinning and fears, when he looks at the ground after he has been at work on a tree for some time, that he has sacrificed too much of the crop, the best plan by far is to count the fruits he has left on one of the main limbs, and gauging the strength of the limb and vigour of the tree he will know by the number of fruits whether he has taken too many or too few, calculating what number of the variety in question is required to fill a case when they reach maturity. I may say here that the beginner nearly always errs on the side of leaving too many on the tree.

In thinning apples and pears which, as stated above, grow in clusters, care must be taken to remove the fruits and leave the stems attached to the

spurs. If the stems are taken off with the fruits, the whole cluster is weakened, and the remaining fruits are liable to fall at a later date. With practice it is comparatively easy to take hold of an apple and bend it upwards in such a way that the stem parts readily from the fruit, but this can be done only if thinning is being carried out when the fruits are still quite small, or are naturally long-stemmed varieties. If they are short-stemmed like, for instance, "Jonathan's" and the apples in the cluster are touching each other, it is nearly impossible to remove one with the fingers without endangering the safety of those left behind. A small pair of scissors with blunt points makes a useful tool: a lemon clips can also be used, or a sharp budding knife in skilful hands performs the work rapidly and well.

December.

Continue cultivation.

Complete the work of thinning out apples and pears.

Carry on the war against fruit fly.

Take special notice of, and report at once, anything that resembles Codlin Moth or its larvæ.

Spray for Orange Aphis where necessary. The heat of summer will, no doubt, have a checking influence on the pest this month, and spraying may not be necessary, but where needed it is false economy not to apply it.

In the stone fruit districts marketing will occupy a large amount of growers' time this month. Grade to size and quality. Never mix large and small fruits, nor good and inferior fruits in the same case.

FARMERS.

A caustic critic thus defines the farmers whom he has met: "There are three kinds of farmers. The first is the fellow who says, 'I have no use for books or papers; my father farmed well, and my grandfather before him, and I guess I will be able to do so too.' The second is the fellow who before he can sow his oats in the springtime has to go in and consult some of his books or some of the notes he took while at college, and the same thing if he wishes to know if his hay is ready to cut, and all the other farm operations likewise. This is what you call the book farmer. Then the third is the fellow who has the thorough practical training from the ploughing of the land through all the different stages to the selling of his products in the open market, and has been assisted with a course at some good agricultural college. Thus practice and theory banded together give the proper sort of harvest, and in most cases the right sort of a man to manage any farm or garden."

TABLE POULTRY AND METHOD OF FATTENING.

W. T. RICHARDSON,
Poultry Adviser.

It is surprising to see in our markets the number of birds offered for sale that are not anywhere near marketable condition. Particularly does this refer to cockerels. Good-framed birds are plentiful enough, and that is all that can be said in their favour.

Buyers, while appreciating a good frame, look for more than that. It must be well covered with tender meat, rapidly grown. Size is not everything. Plumpness is the determining factor to good prices.

There is a ready market, in fact a constant demand, all the year round for prime table poultry, at prices that will return a good margin of profit to the grower. This demand should easily be satisfied because the birds are there, yet how many of them are sold profitably: very few indeed, for the very reason that the condition is not on them to justify the label "Prime Poultry."

The complaint is often heard that it does not pay to send birds to auction for table purposes. I heard that statement repeatedly during a recent visit to some of the wheat-growing districts, and while there is a large element of truth in it, when applied to the average run of birds submitted for sale, yet if those same birds had been suitably fed for a short period they would have turned that loss into a profit. Size being a secondary consideration, tenderness and condition must be aimed at.

The most suitable age to market cockerels is when they are about five months old, after which they develop sinew and become tougher as they advance in age.

Select a number of birds to be fattened and dust thoroughly the feathers under their wings and round the region of the vent with sulphur, tobacco-dust, or wood ashes. It stands to reason that birds infested with lice or mites do not show that contentment which is necessary if they are to put on weight rapidly.

Once they are freed from parasites place them in coops, to carry from two to six birds according to size, in a quiet spot where they will not be subject to constant visits and annoyance from other fowls. These coops need not be elaborate affairs, as long as they are high enough to allow their inmates to stand full height comfortably, large enough to enable the birds to move with ease without inducing exercise, and light in weight so that they may be shifted to clean ground as often as is necessary. Light timber or saplings can be used in their construction, covered over with netting and darkened with bags; the darker the better. The front must be slatted, that is to say, made of saplings or narrow strips of board nailed vertically with a clearance of two inches between each to allow the birds to feed through. Or, if you knock the side out of a box and nail a few vertical strips of wood in place of the side, and place under the box as many cockerels as it will hold comfortably, you have a suitable coop for fattening purposes.

Any old box or timber used should be thoroughly disinfected, so as to destroy any red mite that might be present.

A feed tin (waste sheet iron with sides and ends bent upwards), the length of which will be governed by the holding capacity of the coop, should be placed outside and against the slats, allowing sufficient space for the water vessel.

No bottom is required to the coop when same is on dry ground or under shelter. If out in the open a loose sheet of iron placed over it will afford shelter from the rain and sun.

Method of Feeding.—Only finely ground meals should be used, such as pollard, bran, maize meal, etc., mixed with water or skimmed or separated milk, by preference, to the consistency of porridge, and fed three times a day, as much as they will eat in fifteen minutes. Any that is left over should be removed and not used again, as sour food is detrimental to poultry. This process of feeding to extend over three weeks, by which time the birds should be prime. If carried over a lengthier period the birds become stale, and will go off in condition. Do not feed grain of any description. Any small potatoes that are not used for the table can with advantage be added to the above meals if they are boiled and mashed.

Most people think that the fowl when fed in coops or crates for market puts on fat, but this is not the case. The greater part of the weight gained by coop feeding is made up of soft tender meat. There is, of course, a certain amount of fat as well as meat, but not more than is found in the ordinary well-fed steer used for butchering purposes.

When marketing birds crate them of an even condition. One or two birds in poor condition will affect detrimentally the value of the rest.

Turkeys to be fattened need not be confined in pens or coops, as the change may put them off their feed with accompanying loss of flesh. Start feeding gradually three weeks before the young birds are required, and give morning and mid-day mash as previously described, but in this case do not make it sticky or sloppy. Feed mash in "V" troughs, and give all that the birds will readily clean up, removing any left over. The evening meal should consist of wheat only, while water and shell grit should always be available.

Experiment with a few birds for home use, and you will conclude that the little extra attention involved will be amply compensated by the gain in weight and delicacy of your table poultry.

EDUCATION.

A prominent writer has said that the function of education is to give everyone the opportunity of becoming the best that it is in him to become.

Agriculture is an art which renders those who understand it rich, but renders those who do not understand it, however much they labour, to live in poverty.—"H.A.C. Journal."

THE RED LEGGED EARTH MITE.

L. J. NEWMAN, F.E.S.,
Entomologist.

This destructive pest has spread far and wide throughout the South-West, causing great damage to gardens and field crops. It is fortunately confined to the winter months, disappearing on the advent of dry weather. The eggs of this pest, however, can stand long periods of desiccation, dryness and heat. It is by means of this over-summering egg that the pest is carried over from October to May. These eggs are lodged in the soil amongst litter of all sorts, or are blown about the surface of the ground.

After the falling of the first winter rains in May they hatch, and we have the sudden appearance in plague form of this pest. The plants attacked are almost cosmopolitan, but oats, peas, potatoes, lucerne, and some species of clover are the main field crops attacked.

With the view of overcoming this pest the Entomological branch has carried out a large series of experiments during the past winter. The attempt was made to incorporate with some manure a mite-killing agent, and thus produce a combined mitecide and top-dressing fertiliser. The final result of the experiments gave the conclusion that a mixture of carbolic and superphosphate, or Thomas phosphate, effectively destroyed the mite. The proportions of this mixture are as follows:—1lb. of 15 per cent. carbolic powder to 3lbs. of superphosphate or Thomas phosphate. The ingredients should be thoroughly mixed and used as soon as possible. It is advisable to only mix sufficient for each day's requirements. The dust may be applied by hand or by means of a perforated tin; over large areas it can be applied by means of a super spreader, or by removing the tubes from the drill and allowing the powder to drop on to a sloping board. The main object is to get a good even distribution of the dusting powder over and around all infested plants. It is recommended that at least 1cwt. of the mixture be applied per acre of crop.

The time to apply the dusting is after 11 a.m. up to sundown on fine sunny days. The mite does not become active until the foliage has become dry. If the dust is applied to wet foliage it becomes inoperative to a large extent owing to its caking on the leaves. Being purely a contact method it is of little use applying same when the mites are not about. The carbolic is the killing agent, and is very fatal to the mite, as low as a 2½ per cent. causing great mortality. The formula recommended equals about 4 per cent. carbolic content. To use any stronger carbolic percentage is not recommended as same will burn many plants.

This mixture will not destroy the eggs.

It is therefore necessary to repeat the dusting operation after a period of eight to ten days, when the mites will have issued from the eggs, and be destroyed before another batch of eggs will have been laid.

The cost of the treatment, which is not excessive, is greatly offset by the extra returns received from an area so treated. By the use of this combined mixture a mitecide and fertiliser have been applied, with the one expenditure of labour and time.

If not desiring to use a manure basis, lime, tobacco dust, or any other inert dust may be used in the same proportions.

There are several firms in the city who supply this mixture in a ready to use form.

FRUIT PRODUCTION AND EXPORT FOR SEASON 1924-25.

Geo. W. Wickens,
Officer in Charge Fruit Industry.

The Fruit Season of 1924-25, taking it on the whole, has been a successful one. The crop, while not so heavy as in the record year of 1923, was good, and prices, both at Home and abroad, were much better than in that season. The four principal kinds of fruit produced in Western Australia are—apples, grapes, oranges, and pears: the area devoted to production of these being:—apples, 9,672 acres; grapes, 5,235 acres; oranges and mandarins, 3,423 acres; pears, 1,308 acres; aggregating 19,638 acres, or four-fifths of the total area of 24,016 acres under fruit in the State. A strong demand for prime apples for export was consistently maintained throughout the season, prices ranging from 7s. to 10s. on rails at growers' sidings, and the returns to date show that those growers who decided to ship on consignment instead of selling direct to agents lost nothing by the action taken.

I have been interested in going through the account sales of various London fruit brokers and salesmen, whose catalogues are forwarded to this Department, to note how regularly throughout the past season Western Australian apples have topped the markets in competition with the Eastern States and New Zealand. As a matter of fact this same compliment has been paid to our apples by London buyers ever since the State commenced exporting in commercial quantities, and it is pleasing to find that though there may be, and no doubt are, improvements still to be effected in our methods of placing the fruit on the English market, at any rate we are not lagging behind, but are keeping more than abreast of, our Australasian competitors.

The bulk of the returns in the catalogues referred to showed prices ranging from 14s. to 20s. per case, with many fairly large consignments averaging 17s. 6d. to 18s. 6d. per case. Some little time ago the State Fruit Advisory Boards in several of the States worked out the cost of producing a bushel case of apples and placing same in season 1924 on the London market, when ocean freight was 4s. per bushel, the same as in the season under review. The total cost arrived at by each board was very nearly the same, and the Western Australian figures, which I quote hereunder, show that it takes 3s. 11d. to produce a bushel case of apples, and put it on the bench ready for packing, and a further outlay of 9s. 0⅜d. to place same on the English market, making a total outlay of 12s. 11⅜d. per case by the time the fruit reaches the buyer. A well-kept apple orchard in full bearing should produce 150 to 200 cases per acre, so it will be seen that the prices quoted above have allowed a fair margin of profit to the grower. The total quantity of apples shipped for year ending 30th June, 1925, amounted to 347,342 cases, and the estimated cost of producing and marketing in England one bushel case of apples is as follows:—

	s.	d.
Cost of production (ready for packing) including interest on capital, of fruits exported overseas	3	11

	s.	d.
Cost of—		
(a) Case made up to bushel size	0	10
(b) Packing labour (including stencilling) ..	0	6
(c) Packing materials	0	3½
(d) Local cartage and freights to export wharf	0	7
(e) Any other charges—wharfage at port of export	0	2½
Export oversea charges—		
(a) Shipping charge	0	4
(b) Customs export inspection fee	0	0⅛
(c) Freight	4	0
(d) Insurance	0	1¾
(e) Consolidated charges (London)	1	1
(f) Selling brokers' commission	0	8
(g) Bank exchange	0	4
(h) Advertising fee (London)	0	0½
(i) Any other charges	—	
Making a total of ..	12	11⅜

Neither the local nor the English markets for grapes had a pleasing tale of satisfactory prices to unfold, and unfortunately this refers to both the fresh and dried product. Many consignments of fresh grapes opened up badly in England, and brought very low prices, while others which landed in good condition reached high prices. The case used for the major portion of the shipments was the three-quarter bushel flat, and the fruit was packed in granulated cork: the same case and method of packing has been used for a number of years, and our principal export variety—Ohanez—has usually opened up well under these conditions, but this year has been an exception, and a few small lots put up in trays, which landed in good order and sold well will, no doubt, cause growers to give the smaller packages a much bigger trial next year.

Part of the difficulty experienced with the grape crop was caused by an unusual—for Western Australia—summer rain, which did a considerable amount of damage to the currants and muscats while on the vines, and rendered drying operations difficult. The rain also had a bad affect on some of the table grapes, particularly those varieties which set berries closely together; the berries in the centre of these decaying and causing a great amount of extra labour in cutting out prior to packing.

The total quantity of fresh grapes exported for year ended 30th June, 1925, amounted to 25,974 cases.

Orange trees are not carrying as good a crop throughout the State this year as last, some districts being decidedly light, while others are from medium to good. Present indications point to a smaller quantity being exported this year than last, but some agents have bought small parcels for shipment at the satisfactory price to the grower of 10s. per bushel case on rails.

The total quantity exported for year ended 30th June, 1925, amounted to 12,580 cases, but the great majority of these were shipped during the last half of 1924.

There was a good crop of pears throughout the State in the 1924-25 season, and more than double last season's quantity was exported, but prices on the English market were very variable through some of the fruit arriving in bad order.

The total quantity exported for year ended 30th June, 1925, amounted to 16,886¾ cases.

Full particulars of the ports of shipment, number of cases, kinds of fruit and markets to which it was forwarded, are as follow:—

Export of Fresh Fruit from Western Australia for Year ending 30th June, 1925.

Destination.	Apples.	Grapes.	Pears.	Peaches.	Nectarines.	Plums.	Quinces.	Passion Fruit.
	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.
London	149,127	12,571	8,398¾	24	66	10	1	23
Do.	84,732	...	5,657½	...	...	...	...	...
Do.	29,813	...	738	...	...	...	...	...
Liverpool	10,249	620	75	...	...	...	...	...
Do.	8,245	...	...	...	...	...	...	...
Hull	8,189	255	223½	...	...	...	...	...
Do.	17,160	...	1,129	...	...	...	...	...
Port Said	4,089	...	...	...	...	...	...	...
Do.	500	...	...	...	...	...	...	...
Durban	297	...	...	...	...	...	...	...
Do.	1,197	...	...	...	...	...	...	...
Cape Town	1,375	...	...	...	...	...	...	...
Hamburg	1,044	...	...	...	...	...	...	...
Calcutta	85	...	...	...	...	...	...	...
Singapore	10,301	6,003	277½	22	20	...	21	...
Batavia	4,277	498	256½	2	1	...	...	...
Samarang	642	196	31½	5	...	5	...	...
Sourabaya	9,029	2,503	99½	38	10	5	4	...
Colombo	6,789	3,098	...	...	...	...	...	...
Mauritius	194	230	...	...	...	...	...	...
Tavoy	2	...	...	...	...	...	...	...
Banjoewangie ...	6	...	...	...	...	...	...	...
Totals	347,342	25,974	16,886¾	91	97	20	26	23

Destination.	Loquats.	Lemons.	Oranges.	Shipped from			Total.
				Albany.	Bunbury.	Fremantle.	
	cases.	cases.	cases.	cases.	cases.	cases.	cases.
London	...	...	8,240½	...	...	178,461½	299,402
Do.	...	...	...	90,389½	...	...	
Do.	...	...	...	...	30,551	...	
Liverpool	...	...	...	...	...	10,944	19,189
Do.	...	...	...	8,245	...	...	
Hull	...	...	...	...	...	8,667½	26,956½
Do.	...	...	...	18,289	...	...	
Port Said	...	...	...	...	...	4,089	4,589
Do.	...	...	...	500	...	...	
Durban	...	...	...	297	...	...	1,494
Do.	...	...	...	...	...	1,197	
Cape Town	...	...	...	...	...	1,375	1,375
Hamburg	...	...	...	...	...	1,044	1,044
Calcutta	...	...	...	...	...	85	85
Singapore	¾	136¼	1,752½	...	...	18,533¾	18,533¾
Batavia	...	96¼	2,241	...	...	7,371¼	7,371¼
Samarang	...	6	31½	...	...	917	917
Sourabaya	...	3¾	236½	...	...	11,928¾	11,928¾
Colombo	...	...	76¼	...	...	9,963¼	9,963¼
Mauritius	...	...	...	...	...	424	424
Tavoy	...	...	...	...	...	2	2
Banjoewangie ...	...	...	2	...	...	8	8
Totals	¾	242¼	12,580¼	117,720½	30,551	255,011½	403,283

It will be seen from the above that the fruit shippers are keen in seeking out overseas markets, and in addition to the places named Western Australian fruit was transhipped in England for Stockholm, Gothenberg, Cologne, and Copenhagen. The fame of the apples in the red cases has spread to Europe, for I was shown a cable from a firm in Stockholm asking to be put in touch with someone who could supply the apples in the red cases, and I know that satisfactory trade resulted.

PEPPERMINT IN WESTERN AUSTRALIA.

In our June issue we published a "Report on Four Years' Experimental Cultivation of Peppermint in Western Australia," by H. V. Marr, and readers of this "Journal" will be interested in the following extract from the "Perfumery and Essential Oil Record" which has been kindly supplied to us:—

"*Western Australian Peppermint Oil.*—Two samples of West Australian Peppermint Oil, 1923-24 and 1924-25 crops, have been submitted to us by Plaimar, Limited, Perth, Western Australia (agents Plaistowe & Company, Limited, London N.). They compare very favourably with the English variety in odour and flavour. Critically examined they are both slightly more aromatic; the older sample has acquired a more distinct bouquet or roundness than the other, and has no trace of that sense of bitterness to the taste that is sometimes developed in the ageing of peppermint oil. The aroma is particularly pleasant and the flavour not too pungent when cordials were prepared from them, which appeals as a distinct point in favour of the oil for confectionery and flavouring purposes. A few plain paste lozenges made and similarly compared with those from Mitcham oil could not be distinguished by several persons; to us, however, they were slightly more aromatic and not quite so strong—an agreeable difference in regard to its use for that class of work. Again the aroma would be distinctly favourable for perfumery use and for toilet-soap perfuming. An extemporaneous water made by agitating five drops with a pint of cold water is an excellent mouthwash for smokers, and with both samples so prepared the sense of freshness and cleanliness in the mouth was appreciably noticeable and lasting. An opportunity occurred for use in toothache; the older sample was tried on a plug of cotton wool, with gratifying result. Made up into essence and consumed with a little warm water and sugar in the usual way, one could obtain no opinions of any difference, indicating the close comparison with the best oil of peppermint obtainable."

CITRUS BROWN ROT.

W. M. Carne, F.L.S.,
Botanist and Plant Pathologist.

Experiments conducted this season have demonstrated in a remarkable way the effectiveness of copper sprays in preventing the Brown Rot and the accompanying leaf blight of citrus trees. It has also been demonstrated that spraying for greatest effect must be done before the autumn rains commence.

Mr. A. C. R. Loaring, at Bickley, delayed spraying until after the first rains. The disease had broken out and continued for ten days or so after spraying, and then practically ceased. When inspected on the 21st of July less than one dozen affected fruits were found, and these were, with a few exceptions, above the sprayed portions of the trees. Adjoining orchards were all more or less affected, in one case very seriously, although only separated by a fence. In previous years Mr. Loarnig's orchard was the most seriously affected in the neighbourhood.

At Maddington Mr. Birrell's orchard suffered very severely last year, some of the lemon trees being entirely defoliated. The orchard was sprayed at the end of April, with the result that the trouble has been of no consequence this year. The defoliated lemon trees are recovering, though the effects of the disease last year prevented the trees fruiting this season.

At Pickering Brook spraying was delayed on Mr. Owen's orchard until after rain. The disease appeared, but has been of little consequence since spraying, though plentiful last year. The trees badly affected last year are recovering.

Mrs. Cross, of Roleystone, did not spray until June. On the 31st July only slight traces of the disease could be found except on one mandarin tree which had been accidentally missed in spraying. The unsprayed tree had lost about one-half of the leaves and nearly all the fruit.

Both Bordeaux and Burgundy mixtures have been used, and at different strengths, with equal effect. It is evident that weak solutions are quite sufficient. Bordeaux (4-4-50) or Burgundy (4-6-50) mixture, applied not later than the end of April, is recommended. In spraying, growers are advised to spray the trees thoroughly to about breast high. This has proved very effective on Mr. Loaring's orchard, and is preferable to spraying all over the trees. Trees sprayed all over are liable to increased scale infection owing, it is believed, to the destruction of fungi (not insect parasites), which tend to keep the scale insects in check. By partial spraying effective control of the disease is secured without destroying the useful fungi, and at the same time there is an economy of labour and spray material.

THE KITCHEN GARDEN.

G. N. Lowe,
Senior Potato Inspector.

RHUBARB.

This product, which is classed as a vegetable, actually takes the place of a fruit in household economy, and a very fine standby it is, being easily grown and giving a remarkable return when treated properly.

An instance called to mind is that of a gentleman who has planted roots of rhubarb in two large packing cases at his home, and from these plants supplies the needs of a small household. To obtain results of this kind, it is necessary, of course, to supply adequate fertiliser and water during the dry periods.

As rhubarb is a gross feeder a plentiful supply of stock manure and artificial is necessary, as few vegetables produce such immense growth of leaf, stalk, and root.

Trenching to a depth of two feet six inches by four feet wide is necessary, the number of "crowns" at a distance apart of three feet to determine the length of the trench.

When two or more rows are planted allow four feet to separate them.

After opening the trench as above, mix half the soil so removed with a similar bulk of well-rotted stock manure, to which should be added bonedust and blood and bone to the quantity of two pounds to each barrow load as a rough guide. Replace this mixture in the trench to within 12 inches of the surface, including any garden refuse at the time which may be profitably turned to account in this manner. The top 12 inches, if of old garden soil and containing plant food from previous crops, will not need treating so heavily with fertiliser. New and poor soil, however, on the surface will be benefited by the inclusion of good rotted stock manure to the extent of one kerosene tin plus a double handful of high-class blood and bone to the square yard.

The winter crop—and "Topp's Winter" is a fine general purpose variety for this planting—should be planted in autumn after the bed has had some little time for sweetening and mellowing by atmospheric influence.

Summer growing varieties should be planted in July, August, September, and early October to become established thoroughly before the summer arives.

In planting rhubarb roots or "crowns," as they are more frequently designated, care should be taken that the top portion is not covered to a greater depth than 2½ inches, as there is a tendency to rotting at greater depths. Give the bed a thorough soaking after planting, and keep it moist at all times. Incidentally in all established garden beds, whether planted with vegetables or flowers, one good soaking is worth half a dozen light waterings, which only moisten the surface to evaporate as the sun appears.

Once the plants are established a plentiful application of liquid manure will be well repaid, and a mixture of one small handful of sulphate of ammonia or nitrate of soda, and a like quantity of superphosphate and sulphate of potash to a kerosene tin of water, should be watered in about 12 inches from each plant fortnightly. Keep the surface of the bed well worked, moist and free from weeds, which will be troublesome due to the good treatment of the bed with manures.

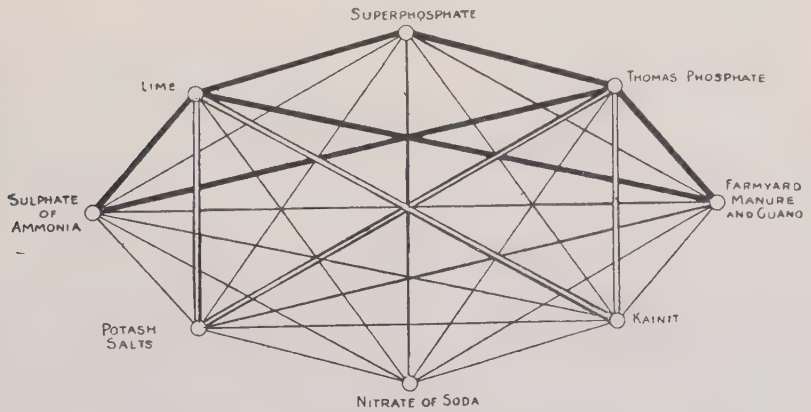
Householders are advised to obtain "crowns" for establishing their beds—rhubarb from seed is best left to the other fellow.

Every third year completely replant a bed as described, to ensure the maximum results.

In pulling the stalks leave sufficient to carry on the plant in full vigor, giving them a backwards and sideways pull till released from the plant.

HOW TO MIX FERTILISERS.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures.



Substances connected by thick line must not be mixed together.

Substances connected by double line must only be mixed immediately before use.

Substances connected by single thin line may be mixed together at any time.

VITICULTURAL NOTES.

H. K. Johns.

OCTOBER.

Cultivation should be well advanced in case dry weather should set in and the ground become too hard.

Weeds will now be growing strongly, and should be given no quarter.

Cultivators should be kept going in order to keep the soil in good tilth.

Where young vines have been planted out they should be watched, and in cases where the soil shows a disposition to cake they should be hoed and the soil well stirred up; provided this is done the vines will benefit by such culture rather than otherwise.

In various places misshapen and badly-formed vines have come under my notice, due mainly to want of proper care and attention during the early period of growth, and I strongly advise that careful attention should be applied to young vines in their second year. As soon as the buds start, or as soon as they have developed shoots of a few inches in length, the vines should be disbudded.

This consists of removing by hand all expect the two largest and best placed shoots, and this will give upright growth for formation of a permanent vine trunk. At times it will be found better to leave less developed buds than a shoot that, when it grows, will make a misshapen vine trunk and head. Vines at this period may make vigorous growth, but a large part of it is wasted unless disbudded and trained.

The more vigorous the vine the more careful the training required.

After this first disbudding it will be found that the two shoots left will grow rapidly, and when the growth is about twelve inches in length they should be carefully tied up loosely to a stake as a protection against winds.

Keep a sharp lookout for Cutworms amongst young vines, and also any grafted ones.

Black Spot (*Anthracnose*): If unseasonable weather prevails, such as wet weather with muggy, humid conditions, spraying with Spring Bordeaux Mixture should be applied, as per following formula:—

Copper Sulphate—6lbs.
Freshly burnt Lime—4lbs.
Water—40 gallons.

Odium.—Given suitable weather conditions this fungus will not doubt make its appearance, and the most successful treatment to be applied during the month is the dusting of the vines with Flowers of Sulphur, first applied when the shoots are in the vicinity of six to eight inches in length. If moist weather prevails applications of sulphur to be applied at intervals of eight to ten days. The sulphur should be dusted on in the early morning as far as possible. Do not make applications of sulphur when there is a sudden drop in the temperature, as the sulphur becomes more or less ineffective by failing to evaporate at a low temperature.

Cincturing.—Preparations for cincturing of currants, such as removal of outer rough bark, should be gone on with as spare time avails.

This will assist materially to expedite the work of cincturing, as it is necessary that it should be done as speedily as possible in order to check the flow of sap to the newly formed berry until such a time at it sets firmly on the bunch. Cincturing is carried out just at the time when the flowers on the bunch have started to die and fall, or when the berries are the size of small shot.

Cellar.—Do not leave unfortified wines on ullage.

Make a practice of filling up regularly, with a carefully selected, sound wine.

If hot weather prevails closely examine all young wines; more especially wines of a fruity nature that are unfortified, as they may need immediate attention.

NOVEMBER.

Summer is upon us once more with a lot to be done during this month. Keep one object in view in regard to cultivation, that is, a protective tilth to be maintained in the soil.

Always cultivate after each rain, and if none is forthcoming, cultivate at least once in every three weeks.

This is essential for conserving moisture. Young vines to be examined carefully and to be kept well hoed and soil well stirred up. The growing shoots will need a second tie as a preventive against damage by heavy winds, and when they have hardened up it will be found advisable to remove the weakest of the two; this enables the vine to concentrate all its energy to the growing and developing of good sound wood for young vine trunk formation. Grafted vines also require special attention and treatment as per my remarks on young vines.

Disbudding.—I find this important factor unfortunately is omitted in various vineyards. I strongly contend that it should receive just as much careful attention as pruning. Repeatedly I have noticed the energy of vine growth going to superfluous wood such as water shoots—nonproductive wood, consequently the fruit and wood for pruning for the following season is not receiving the full amount of plant food that it really should. Disbudding of unnecessary growths such as water shoots and non-fruiting wood, where not required for formation purposes, should be carried out, also pinching back or checking of growth to prevent their becoming unnecessarily long.

Cellar.—Closely examine young fruity unfortified wines; at first signs of sickness treat immediately. Keep all dry wines filled.

DECEMBER.

If long continued dry weather be experienced it will tell on all growths, and especially in the case of young vines, the soil of which should be kept thoroughly pulverised and free from weeds. Surface cultivation of the vineyard should be kept going in order to destroy all weeds and prevent the formation of a surface crust, which facilitates evaporation.

All the ordinary work should be completed by the end of this month.

Except in the event of rain and humid, muggy weather, sulphur dusting to be applied for Odium.

Cellar.—All dry wines to be kept filled, and if hot weather prevails, cellar to be kept as cool as possible.

MULCHING EXPERIMENT.

Chapman Experiment Farm, 1924.

I. THOMAS,
Superintendent Wheat Farm.

The object of this experiment is to determine how far and under what conditions the cultivation of winter fallowed land is profitable.

The soil on which the experiment was carried out is a red sandy loam, being typical of jam country. The plots were ploughed four inches deep with a mouldboard plough early in August, and were cultivated with a Springtyne cultivator when required for carrying out the experiment.

Plot No. 1 received a cultivation late in August, again in October, twice during February, once in April, and again prior to seeding. At planting time the ground was in excellent order and free from weeds.

Plot No. 2 received similar cultivation during August as Plot No. 1, but had no further cultivation until immediately before seeding. It was then in very fair condidtion, though not in the same tilth as was the case in Plot No. 1.

Plot No. 3 had no cultivation after ploughing until immediately before planting. At planting the tilth was rough. A little dead grass and other weeds were also present on the surface.

The seasonal rains commenced on the 11th May, and the planting of the experiment was done on the 13th under ideal conditions.

The variety of wheat sown was Nabawa, at the rate of 45lbs. per acre, with an application of 90lbs. of superphosphate (22 per cent.).

The area of each plot was half an acre, one-eighth of an acre being cut for hay and the remaining half-acre being left for grain.

The hay results obtained this year, together with the average yields to date, are shown in the table herewith:—

Mulching Experiment—Chapman Experiment Farm.

Variety, Nabawa. Seed, 45lbs. per acre. Superphosphate (22 per cent.), 90lbs. per acre.

No. of Plot.	Treatment.	Hay Yield.			
		Per acre, 1924.	Percentage, 1924.	Per acre. Average, 1914-1924.	Percentage, 1914.
		cwts. qrs. lbs.		cwts. qrs. lbs.	=
1	Cultivated Aug., Feb., and April and prior to seeding	36 2 8	107	26 0 0	108
2	Cultivated Aug. and prior to seeding. ...	34 0 24	100	24 0 16	100
3	Cultivated prior to seeding only	25 2 16	75	19 2 24	87

Before the plots reserved for grain could be harvested they were destroyed by fire, and no results were therefore obtained.

The results obtained this year confirm the conclusions and recommendations that have been made from previous results obtained each year since 1914, namely, that the general practice should be to cultivate the fallowed land in the spring and again prior to seeding, and that in cases where the ground is weedy this cultivation should be supplemented by additional cultivation after rain during summer.

Further, as shown by the results obtained at Merredin this year when the September rainfall was scanty, spring and summer cultivations not only destroy weed growth but also act as an insurance against a period of short rainfall.

MERREDIN EXPERIMENT FARM.

J. H. LANGFIELD,
Manager.

The mulching experiment has been carried out at this Farm each year since 1915. The land on which this experiment was planted is heavy forest country. The three plots required for the experiment were ploughed four inches deep with a heavy disc plough in June, and cultivated as required with a Springtyne cultivator, and were planted on the 22nd May with "Nabawa" wheat at the rate of 45lbs. per acre, with an application of 84lbs. of 22 per cent. superphosphate.

Plot No. 1 was cultivated in September, after rain (25 points or more) during summer, and again prior to planting. A perfect mulch was obtained and maintained throughout the fallow period.

Plot No. 2 was cultivated in September, but received no further treatment until seeding time, when it was worked down until a good seed bed was formed. Weeds grew and developed on this plot, and a considerable number of wild oats grew in patches.

Plot No. 3 was a "neglected" fallow, the ploughed land being uncultivated until seeding time, when it was also worked down to make a good seed bed. This plot was very weedy, it also "set" down, and became so hard that it was found necessary to cultivate it twice before a good seed bed was obtained.

The results obtained this year, together with the average yields to date, are shown hereunder:—

Mulching Experiment—Merredin Experiment Farm, 1924.

No. of Plot.	Treatment.	Grain Yield.			
		Per acre, 1924.	Percentage 1924.	Per acre. Average, 1915-1924.	Percentage, 1915-1924.
		Bush. lbs.	%		%
1	Mulched in Spring: after summer rains, and before planting ...	27 16	116	23 23	102
2	Mulched in spring and before planting ...	24 5	100	22 51	100
3	Neglected fallow cultivated before seeding only	25 20	105	21 47	95

No. of Plot.	Treatment.	Hay Yield.			
		Per acre, 1924.	Percentage, 1924.	Per acre. Average, 1915-1924.	Percentage, 1915-1924.
		cwts. qrs. lbs.	%	cwts. qrs. lbs.	%
1	Mulched in spring: after summer rains and before planting ...	50 2 24	109	51 2 0	104
2	Mulched in spring and before planting ...	46 2 16	100	49 2 8	100
3	Neglected fallow, cultivated before seeding only	45 2 8	98	49 1 20	100

THE GOSPEL OF THOUGHT.

The farmers might do well to ponder over what someone has said:—

"The mind that is full of the trifles of never-ending daily duties is not a good place for large ideas to originate and develop. The gospel of work is a good gospel to preach and to practise, but it is not the only good gospel. It pays to sit and think—not to lounge and dawdle, but to think with an active mind and a definite purpose."

WHEAT YIELD COMPETITION.

(No. 2 Zone.)

In our last issue, page 257, the average yield per acre of Mr. A. Elder's crop, Moulyinning was shown as 21 bushels 16 pounds. This was caused through a clerical error, and should read 21 bushels 34 pounds, and thus entitles Mr. Elder to one more point in the competition.—[Ed.]

PHOSPHATIC FERTILISERS AS MANURES FOR GRASS LAND.

A. B. Adams, Dipl. Agric.,
Agricultural Adviser, Dairy Branch.

The manuring of grass land has been carried out for a long period; at first chiefly with farmyard manure, when any could be spared from the arable land, and with the application restricted to the meadows, or grass lands, intended for hay; later, bones and bone ash were used.

The farmers of those days, like the farmers of more recent times, on using phosphatic manures wondered if they contained clover seed.

The fertilisation of grass land received a great impetus with the production of large quantities of basic slag as a waste product of the steel industry, obtainable at a very low price.

This fertiliser gave wonderful results in England and other parts of Europe; on many clay soils causing a growth of legumes (chiefly wild white clover) to such a marked extent that the farmer thought there must be clover seed present in the slag.

Actually there were clover plants present in the pasture before the manure was applied, but in such a dwarf form that they were only to be found after a very careful search.

Many of the results discussed in this paper were obtained by the use of slag, but it must be constantly remembered that the slag was used in most cases because it was the cheapest form of phosphatic fertiliser on the market, and not because it had given better results than other phosphatic manures. The general English practice has been to use a heavy dressing of slag, up to 10 cwt. per acre, and not give another application for about ten years.

By considering the results of manurial experiments and demonstrations which have been conducted in other countries over a comparatively long period, it is possible for us to learn something of the results to be expected, and of the factors involved in the results obtained.

The effects of topdressing permanent grass with phosphatic fertilisers may be classed under the following heads:—

(a) The increase in quantity of feed.
(b) The change in the botanical character of the herbage.
(c) The improvement in the quality, as distinct from the quantity of fodder, as shown by the increased production of meat and milk without any increase in bulk of feed produced.
(d) The improvement in the general health of the cattle.
(e) An improvement in the chemical and physical characteristics of the soil.

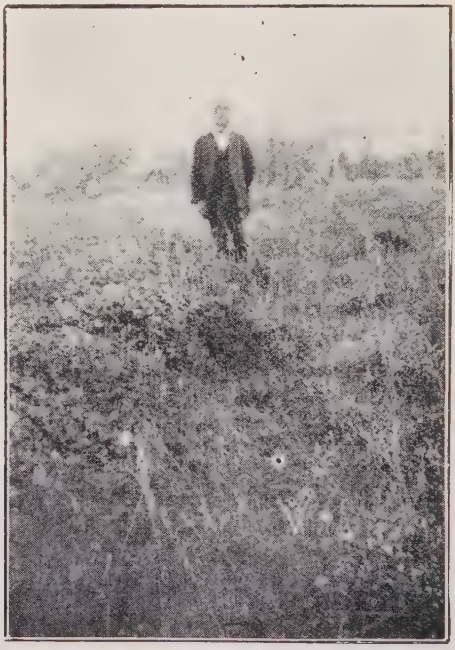
(a) *The increase in Quantity of Feed.*

An increased growth of herbage is one of the first and most striking results of the use of superphosphate on grass land, in the South-West of this State. It has been well and truthfully said that it does not so much

cause a difference as a contrast. This will be noted from the figures, and also from the illustrations with "Pastures—Top-dressing Experiments" by Mr. G. K. Baron-Hay (page 51 of the present volume). This contrast is only to be seen when the paddock is closed and is not depastured by stock. There are numerous cases reported where the manured portion of a paddock showed greatly increased growth until stock were turned in. The animals kept to the manured part, and left the unmanured part severely alone; consequently, after some time the unmanured portion appeared to have the greatest amount of feed.

From the results of the top-dressing experiments officially reported in this State last season, the growth was increased two and a-half times on the average.

In Victoria somewhat similar results have been obtained by cutting the grass crop, taking the average for that State and calling the yield of un-



manured grass 100, the use of 1 cwt. of superphosphate per acre gave 197, and the use of 2 cwt. 275, an increase of 97 per cent and 175 per cent. respectively.

(b) *The Change in the Botanical Character of the Herbage.*

This change is most noticeable on land which has normally a thick growth of grass and miscellaneous herbage with but few clovers and trefoils present; it is a condition more common in Europe than in this State, but is occasionally noticeable here. Taking the average of the plots top-dressed last year, the percentage of leguminous plants present was increased from 26 per cent. on the unmanured, to 61 per cent. on the 1 cwt. superphosphate, and 71 per cent. on the 2 cwt. superphosphate plot.

(c) *The Improvement in the Quality of the Feed.*

Under our conditions the improvement of quality without any increase in quantity is very exceptional, as usually the application of fertliser results in a greatly increased growth of feed. This condition might be expected on some of the coastal soils rich in lime; soils which are naturally well grassed. At Quindalup, near Busselton, plots top-dressed in 1923 gave no apparent difference in amount of feed. Unfortunately it was impossible at that time to determine experimentally the increased feeding value of the manured plots, but knowing the increased carrying capacity of somewhat similar land in the vicinity when top-dressed, one would think that parallel results to those in other countries would have been obtained. At Cockle Park, Northumberland, England, basic slag applied to the soil on Tree Field not merely gave an increased quantity of mutton and hay, but almost doubled the proportion of phosphoric acid in the hay, so that the amount of phosphoric acid consumed per acre by the animals was quadrupled by the addition of phosphatic manures. It has been found that a manured field when mown gave little if any increase in weight of hay, but when grazed it gave a big increase in mutton as compared with the unmanured portion.

(d) *Improvement in Health of Cattle.*

One of the most important results from the use of phosphatic fertilisers is the distinct improvement in the health of the live stock. A sufficiency of phosphates in the diet is absolutely essential to health. On a phosphorus deficient pasture, cattle become unthrifty, and commence bone-chewing with all its attendant evils.

Bone-chewing is an indication of an acute shortage.

A slight deficiency, though injurious, is not so noticeable to the ordinary observer.

Sheep under similar conditions do not thrive or hold their condition as they should do, and it will be noticed that the stock-carrying capacity of the holding declines in spite of the fact that there does not appear to be any actual shortage of feed.

Mature horses will probably not show any marked ill-effects, but it will be found impossible to rear foals or young horses with good bone and limbs, on markedly deficient soils; they will develop crooked limbs and swollen joints. Breeding and milking animals, having the greatest call on phosphates, are those that will suffer the first. Professor Somerville (Jour. Brit. Board of Agri., Feb., 1918) says, "the improvement was also reflected in the health of the stock. The mortality on the ewes in 1911 (when the experiment commenced) was 15 per cent., and in 1917 it was only four per cent."

(e) *The Improvement of the Soil.*

The changed character of the soil after a period of phosphatic fertilisation can be grouped under two heads:—

(1) Chemical.

(2) Physical or mechanical.

The chemical change is due to the residues of the fertilisers remaining in the soil, and as the phosphates when in contact with the soil are but very slightly soluble, practically the whole of the phosphate applied, which has not been sold off the farm in the form of animal or plant products, remains in the top foot of soil. At Woburn it was found that the whole of the phosphate, applied over a series of years, which had not been sold off in the crop, remained in the top nine inches of soil. This is, of course, an increase of plant food directly due to the farmer's application of fertiliser.

There is another very important increase, that of nitrogen. The increased growth of the leguminous plants, *i.e.*, those belonging to the pea, bean, and clover family, causes an increase in the amount of nitrogen present in the soil. It is now common knowledge that the plants of this family have the faculty of obtaining nitrogen from the air by means of the bacteria on their roots, and the whole of this, with the exception of that sold off in crops, etc., is returned to the soil. Soluble nitrogen is easily washed out of the soil.

Much of the increased supply of nitrogen, however, is present in the soil in the form of humus from root and stem residues and animal droppings.

Most of the nitrogen in this form is not immediately soluble, a small percentage under favourable conditions being constantly rendered soluble and available to the growing plants by the action of the soil bacteria. When the land is under permanent grass, the loss of nitrogen in drainage water is not as great as on arable land, because there are generally plants present to make use of the nitrogen as it is rendered available; consequently, grass land regularly fertilised with phosphatic manures alone, will have a steadily increasing nitrogen content.

This accumulation of organic matter is apt to cause an increasing acid reaction in the soil. At Cockle Park it was found that the soil became more acid after heavy dressings of slag, due to the increased amount of humus in the soil, and the clovers tended to decrease.

There was a marked improvement after the next application of slag. As the plot that was receiving lime also tended to lose clover, it would ap-

pear that P_2O_5 is the limiting factor and not acidity. It is probably of no use to use either lime or potash until the demand for phosphoric acid has been satisfied.

(2) *Physical or Mechanical Changes.*

The mechanical effect on the soil is almost entirely due to the increased root-growth penetrating deeper into the soil and the accumulation of humus. At Cockle Park where phosphates are used in large quantities the roots break up the soil and convert a very indifferent clay into a fair loam. These results follow from the changed bacterial and fungoid decompositions of organic matter in the soil, which are induced by the kind of fertilisers applied to the field. On the unmanured plot yellow clay still remains close to the surface, yet on the plot that has been manured for over twenty years with basic slag a very useful loam soil extends to 10 or 12 inches from the surface.

(*To be continued.*)

ERRATUM.

In the June issue, the last paragraph of Mr. Adams article on "Phosphatic Fertilisers as Manure for Grass Lands," page 176, should have read, "on the Abba River Groups, basic superphosphate gave very much better results than basic slag, and the use of the latter is not advised under West Australian conditions, unless experiment has proved it the best fertiliser for some particular soil."

THE JARRAH LEAF MINER.

(*Tinea sp.*)

L. J. NEWMAN, F.E.S., Entomologist
and
J. CLARK, F.L.S., Assistant Entomologist.

During the past four years this destructive Lepidopterous insect has caused great damage to the foliage of the Jarrah (*Eucalyptus marginata*). It is also equally bad in its attack on the Swamp Gum (*Eucalyptus rudis*), and is more or less found to be accidently attacking the leaves of the Tuart (*Eucalyptus gomphocephala*), when growing amongst jarrah.

Fortunately the ravages of the larvæ of this moth are so far confined to the coastal jarrah growing on the plain country. Curiously the outbreaks are mainly found in proximity to the ports of Fremantle, Bunbury, Busselton, and Albany. From these centres it radiates in all directions inland for several miles to the base of the foothills. From Albany it has travelled some miles up the Kalgan and King River areas and westward as far as Torbay. Between Torbay and westward to Busselton the country is free from this moth. With the exception of some of the land in the Albany area, which is ironstone and granite, the area infested is of a sandy nature. Although close inspection and observation have been made of the commercial hill-grown jarrah areas, no evidence of the presence of this pest has

Jarrah Leaf Miner Moth (*Tinea sp.*).

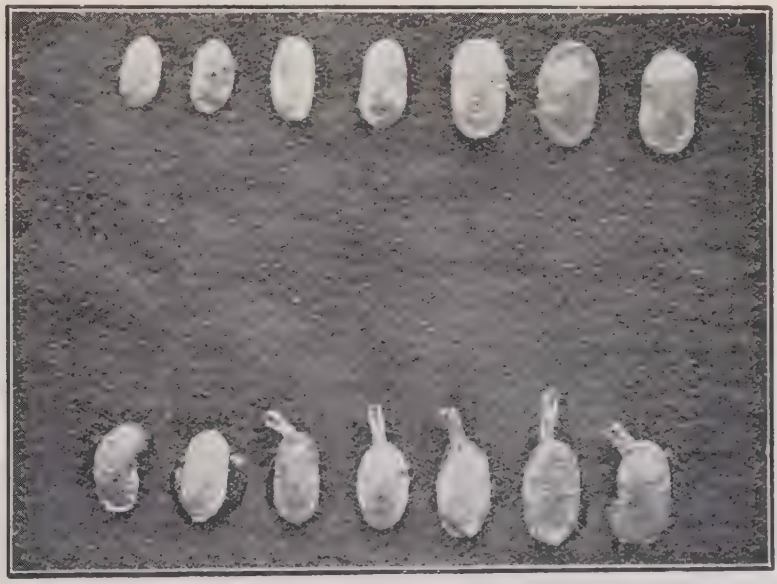
been noted. The fact of its being found mainly in proximity to the various ports might suggest to some the possibility of its being an introduced species. Evidence is against this, as the same insect has been found as far inland as Merredin and Westonia in mild form on *Eucalyptus salubris* and *Eucalyptus transcontinentalis*. Further, the fact that it confines its attention to *Eucalyptus* is strong evidence that it is of local origin.

This Microlepidopteron first attracted our serious attention during the year 1920 by its work on the leaves of jarrah at King's Park, Perth, and Claremont. Casual outbreaks had been noted as far back as 1914.

The leaves of attacked trees were observed to be full of small oval holes and to have been denuded of their chlorophyll or green contents, having the appearance of being scorched by fire. Closer observation and critical examination revealed mines in the leaves inhabited by tiny lepidopterous larvæ. Upon collecting and submitting this material to cage incubation we were rewarded by the emergence of a small and insignificant moth. This moth has proved to be an unnamed and unrecorded species belonging to the Micro-lepidoptera of the Genus Tinea. The mines made by these caterpillars are

Larva of Jarrah Leaf Miner.

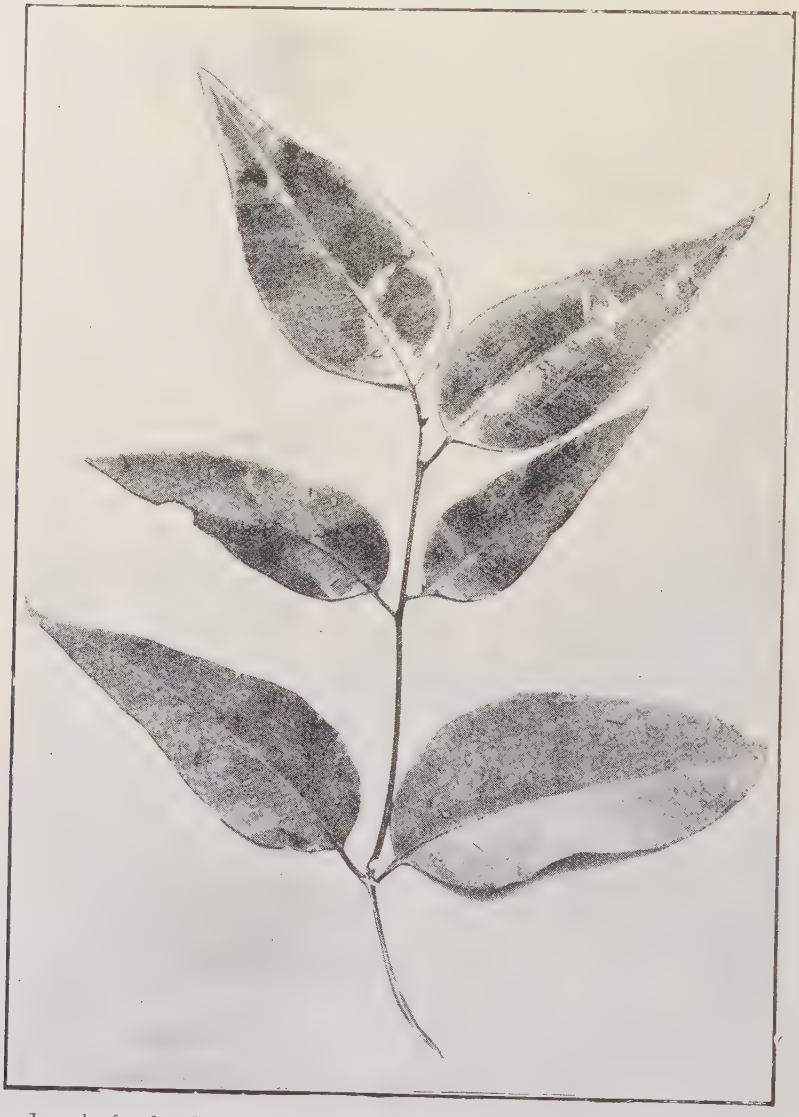
irregular and blotch-like, extending in many instances to all parts of the leaf. They are visible on both sides of the leaf, appearing as reddish-brown blotches, filled with the excreta of the mining larvæ. The number of mines in a leaf may vary from 10 to 50. Leaves on all parts and sides of the tree are attacked, but a preference is shown for those nearest the ground, young saplings and suckers being those most seriously affected.



Cocoons of Jarrah Leaf-miner, composed of epidermal layers of leaf which are cut out by larvae and fall to ground, producing typical oval holes in foliage; also pupae casts of moths as left when issuing. (Original)

The danger from this pest lies in the possibility of its extension to our prime and commercial jarrah areas. The question to be determined is what

actual damage is done to the trees by this temporary defoliation. It is an accepted fact that the loss of foliage deranges the vital functions of tree growth, but to what extent and how may not be so clear. Any influence which checks the growth of timber may be accepted as an economic loss.



Jarrah Leaf. Showing initial stages of leaf-miner. Note spots.
(Original)

The damage by the Jarrah Leaf Miner is temporary as far as the foliage is concerned, and is during the non-growing period of the Eucalyptus, namely, May and June. Any foliage put forth after June is not affected by this leaf miner as the egg-laying moths have all disappeared. It is only

those leaves present on the trees at the time of the issue of the moths in May and June that are attacked. The larvæ do not travel from leaf to leaf, but live in the one mine throughout their life, from May to September. The fact that it attacks the trees at this period, when little growth is being made, is the reason for the dead appearance of the foliage so typical of the presence of this pest. In fact, at a distance, no new growth being made, it looks as if the forest had been severely burned, the leaves appearing all

Jarrah Leaves. Showing second stage of development of leaf-miner. (Original)

brown and dry. In any case, even though the defoliation is temporary, there must be a loss from delayed growth during the months of June, July, and August. In September the trees begin to make fresh foliage, and by the end of the year appear outwardly little the worse for the attack.

It would be of considerable interest to have this point determined as it is the factor which decides the seriousness or otherwise of this insect attack on the foliage. It is fortunate that this moth is single-brooded, otherwise

Jarrah Leaves. Showing third stage of development of leaf-miner.

(Original)

repeated attacks would soon cause the death of the trees. The worst check appears to be to the young seedling and sucker trees, the moth attacking those leaves nearest the ground.

Control.—Owing to the habits of this pest little can be done in the way of control by means of spraying. The eggs are securely deposited under the skin. The resultant caterpillars hatched from these eggs do not come to the

Jarrah Leaves. Final stages of development of leaf-miner. Note typical holes in the leaf.

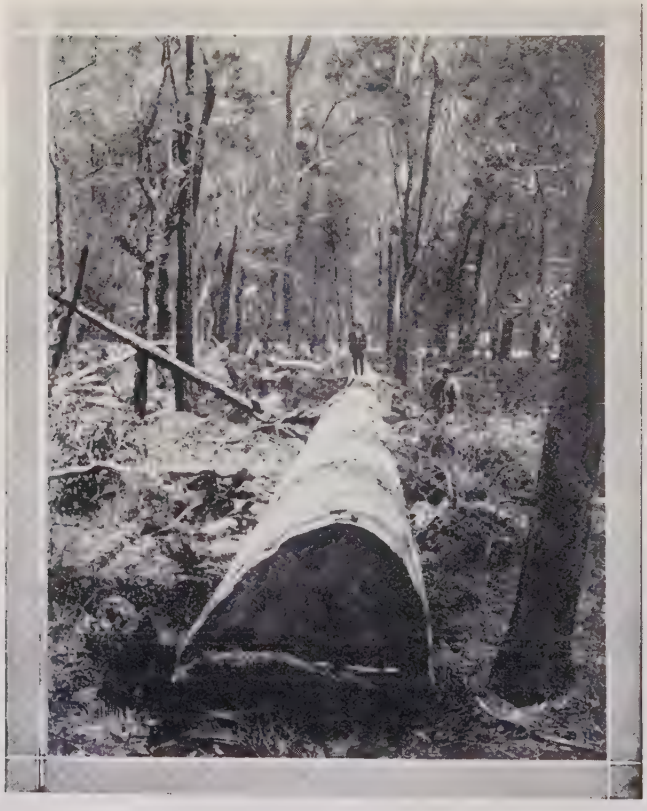
(Original)

surface of the leaf to feed. They commence operations from the point within the leaf where the egg was deposited, and continue within the leaf

until full grown. It is, therefore, obvious that the effective application of any poisonous or contact spray is out of the question. It is possible to poison the adults by the application of some sweetened attractive poison bait to the foliage, but this is not practicable owing to the size of the trees infested, and the large area that would have to be so treated.

The habit of the larvæ of burying themselves in the soil, just below the surface, renders them liable to destruction in large numbers by the application of fire to the bush. The fire passing over the surface of the ground roasts the hibernating larvæ. This method has the strong objection raised against it, in that fire causes great damage to young seedling and growing trees. The burning over with slow fires could be done with good effect in non-commercial jarrah or flooded gum country.

Natural Control.—To date we have failed to breed out or locate any effective internal or predaceous parasites.



A Fallen Giant.

SUDAN GRASS POISONING.

T. Murray-Jones, C.V.O.

Cases of mortality in stock have occurred from time to time, both in horses and cattle, the cause of which has been attributed to the ingestion of Sudan Grass when eaten before reaching the "heading" stage. However, as far as I know or can ascertain, the evidence in each case has been insufficient to warrant condemnation of this variety of valuable fodder as a potential danger.

It is recognised that Sorghum, to which this grass is allied, develops during its development stage, up to heading, a cyanogenetic glucoside which yield on fermentation Glucose, Acetone and Hyrocyanic Acid, but according to Mr. Carne, Government Botanist, the amount is so infinitesimal that it may be grazed at any stage without danger. Mr. Carne has, however, pointed out that there may be times when there is a possible element of danger from poisoning, *i.e.*—

1. When the plant is stunted or slow growing.
2. When the crop is not pure but contains hybrids, between Sudan Grass and Sorghum. These may be recognised by the thicker stems and broad leaves, and when in flower by the more compact heads.

There is no danger of poisoning—

1. When the plants have headed.
2. When cut and wilted in the sun the day before feeding.
3. When made into hay or ensilage.

Cases have been investigated in Eastern Australia where prussic acid poisoning has been traced to the presence of Sudan-Sorghum hybrids. Other cases of supposed poisoning have been definitely put down to digestive troubles, when stock have been injudicially turned on to succulent Sudan Grass.

That stock are found to have died after ingesting silage (Sudan Grass) can only be admitted as *prima facie* and not conclusive evidence that the plant so ingested was of a poisonous character. Other factors that enter for primary exclusion are mechanical effects of a digestive origin—Toximes of a bacterial origin, *i.e.*, Botulism, or commonly referred to as forage poisoning, etc.

In the light of recent investigation in New South Wales the evidence suggests that the plants responsible for deaths were those of young Sorghum and a hybrid variety resulting from crossing Sorghum with Sudan Grass, and not to clean bred Sudan.

The point for stock owners and others interested in the growing of Sudan Grass is to make certain that they are growing from pure Sudan seed, and not of the hybrid or cross-bred variety. The Government Botanist will be pleased to supply information that will enable differentiation between the seeds to be made.

BURR TREFOIL.

(*Medicago denticulata*, Willd.)

A. Plant in flower. B. Plant in fruit. C. Burr (pod) seen from above. D. Burr seen from the side. E. Flower.

(A and B rather less than natural size, C, D, and E slightly enlarged.)

TREFOIL, OR BURR TREFOIL.

(*Medicago denticulata, Willd.*)

W. M. Carne, C. A. Gardner, and A. B. Adams.

Burr Trefoil is one of the hardiest of our annual introduced leguminous plants, and probably the most valuable pasture legume in the areas which have a low rainfall. This plant in order to thrive requires short winters, and temperatures which are not too low. It prefers heavy soils, and requires at least a mean temperature of 52 degrees F. in September and 60 degrees F. in October.

Burr Trefoil is often called "Burr-clover," a name which is misleading, for it is not a true clover, differing from the clovers in its large spiral spiny burr-like pod, and large-toothed or fringed stipules (outgrowths at the base of the leaf-stalk).

The name Medicago is from the Latin *medica,* meaning lucerne, because lucerne was believed to have been introduced into Europe from ancient Media (Northern Mesopotamia). The name *denticulata* refers to the teeth of the leaves or stipules.

Burr Trefoil is naturalised as a common plant in cultivations and waste lands of the South-West districts. It is most common and grows most vigorously on the richest soils, and in gardens and orchards which have been well fertilised, particularly those which have received stable manure. In such places it forms an excellent green manure crop, the plants being turned in while green and tender; if left until maturity the tough stems make ploughing difficult, and may remain in the soil for a long period without decaying, thus making subsequent cultivation difficult, and choking the implements.

Germination takes place during the autumn after the first general rains, and the plant produces seeds during September and October. It is thus one of the earliest of the annual legumes.

Burr Trefoil is an excellent plant for the warmer and drier districts, because it succeeds where the more palatable clovers will not thrive, and its temperature requirements are better suited to the Wheat Belt and Northern districts than to the colder South-West. In the former it thrives in the open paddocks with suitable treatment, but in the South-West districts it requires shelter. Here it is not well adapted to pasture as it is readily eaten out. If eaten short it does not seed, unlike the cluster and drooping-flowered clovers, which manage to mature seeds even when closely grazed.

In the Midland, Victoria, Northern, and Central districts it is the most valuable of the leguminous pasture plants, developing best on soils in which superphosphate has been previously used. It prefers the heavier soils and responds well to top-dressing with one to two cwts. of superphosphate. At Gingin it also succeeds on the limestone hills.

Burr Trefoil is readily eaten by stock when young, but when vigorous and rank it is not liked. When in seed it is also readily eaten. Where it has made good growth it leaves large quantities of burr, which will keep sheep in good condition months after the plants themselves have disappeared. These burrs are objectionable in wool, but in the Victoria, Kellerberrin, and similar districts the advantages of the plant counteract this disadvantage.

The scattering of a few lbs. of seed is worth while where the plant is not common, but as a rule sheep can be depended upon to distribute the seed.

Description of Plant.—An annual with decumbent or prostrate stems; stipules bordered with fine teeth; leaflets obovate-cuneate, toothed at the ends, always hairless on the upper surface. Flowers small, yellow, usually two to eight together on axillary stalks, mostly shorter than the leaves; calyx-teeth as long as, or longer than the tube; standard longer than the wings and keel.

Pod hairless, disc-like or shortly cylindrical, green or brown when ripe, flat at both ends, with 1½ to 3½ coils pressing rather loosely upon each other, about ¼in. diameter without the spines, which are in two rows, slender and mostly hooked at the tips. Seeds three to six in each pod, light yellow and smooth, somewhat kidney-shaped, about ⅛in. long.

WINTER TRAPPING OF FRUIT-FLY.

(*Ceratitis capitata.*)

L. J. Newman,
Entomologist.

To further prove the oft repeated statements of this Office, that the Fruit-fly does not hibernate throughout the winter months, a series of trapping experiments were undertaken. The period covered by the test was from the 5th May, 1925, to the 31st August, 1925, roughly four months. This covers our normal winter, when many people believe the fly to be in hibernation.

This phase of the life history of the Fruit-fly under our winter conditions, as the experimental tests have shown, is so comparatively brief that the term "hibernation" is not correct. What really does happen is a lengthening of the various life stages, but not sufficiently protracted to merit the term "hibernation."

The comparatively small difference between the summer and winter periods of the fly is due to the fact that the relative difference between summer and winter is not great; our winter climate being sufficiently mild to nuture a winter brood. These winter flies are dependent upon winter fruits, such as loquats, oranges, etc., to lay into.

What is demonstrated by these trapping experiments is the need for taking advantage of all fine spells during winter to foliage bait, and in small areas to trap these winter flies. By so doing the carry over of the pest must be reduced.

The following are the monthly totals of males and females captured:—

Month.	No. of Traps.	Males.	Females.	Total.
May	8	154	923	1,077
June	8	79	1,861	1,940
July	8	2	344	346
August	8	1	65	66
Total	...	236	3,193	3,429

The grand total of flies captured was 3,429, of which 3,193 were egg-laden females.

It will also be observed that the males died off rapidly after May.

HOP CLOVER.

(*Trifolium procumbens*, Linn.)

A. Plant (slightly reduced). B. Branch (natural size). C. Flower-head. D. Flower (enlarged). E. Pod, enclosed in flower, and seed (enlarged).

HOP CLOVER.

(*Trifolium procumbens.*)

W. M. Carne, F.L.S., and C. A. Gardner.

Hop Clover is one of the common naturalised clovers of the South-West, and together with *T. dubium,* Suckling Clover, is the hardiest and most widespread of the true wild annual clovers in South-Western Australia. The true clovers have all three leaflets, and can be distinguished from some so-called clovers by the pod, which is enclosed in the calyx, or small green cup which envelopes the flower while in bud. The closely allied Medicago species (trefoils) can be distinguished from clovers by the larger curved or coiled pod, often spiny, and the usually toothed stipules.

Where hop clover occurs in uncultivated land, the plants are usually very small. It makes a strong growth in cultivated land, but is always characterised by the wiry branches lying on the ground.

Hop clover succeeds well on light and sandy poor soils, where sometimes it forms a large proportion of the pasture during the spring. In the South-West and Great Southern districts it is not considered worth sowing, being usually present in most cleared places and when dry it is tough and wiry, stock leaving it for more appetising feed, but when young it is eaten by sheep, and palatable.

The plants germinate during June and July, and mature between the end of September and December, according to season and locality. Although the plant is frequently regarded as a native clover it is an exotic, native to Europe and Western Asia.

Description of Plant.—A low trailing annual plant, usually lying on the surface of the ground. Leaflets almost reversed egg-shaped or wedge-shaped, rounded at the apex, blunt and often indented, usually without any hairs; finely and rather prominently veined; the central leaflet on a short special stalk. Stipules (at the base of the leaf-stalk) broad and pointed, but much shorter than the stalk.

Flowers yellow on short stalks, numerous in an egg-shaped head; the calyx-teeth very unequal—the two upper ones very short, the three lower ones long and pointed. Standard (large petal) widely spoon-shaped, furrowed, withering to a brown colour, and folding downwards over the other petals.

Fruiting-heads cylindrical, hop-like from the papery standards which alone are prominent. The small pod is one-seeded, and enclosed within the withered flowers. The seeds are almost globular, yellow, and very small.

Flowering season August to November.

REARING DAIRY HEIFERS.

Their Value to the West Australian Dairying Industry.

P. G. HAMPSHIRE,
Dairy Expert.

There is no more important subject in regard to the establishment of the Dairying Industry in Western Australia than the proper rearing of all good type dairy heifers. The need of heifers to build up the average small dairy herds of Western Australia, and to stock the group settlement dairy farms, is of paramount importance, and no greater problem confronts the dairying industry of this State at the present time than the securing of large numbers of well-reared dairy heifers. Without doubt, the place where one would expect to find such heifers to be reared is on the dairy farms and cattle-raising country of the South-West, but it is becoming increasingly difficult to secure large numbers of these well-grown dairy-type heifers. As one travels the Great Southern, Midland, and adjacent wheat-belt country it is evident that a considerable number of good dairy heifers could be drawn from these districts, as almost every farmer has a few cows, while many, owing to the late high price of wire netting necessary for sheep-proof fences, carry a considerable number of young cattle which are heifers, but in many instances they do not receive the attention necessary to build up into good cows.

In the districts referred to the farmers are well advised to aim at "calving down" about May or June. This ensures that there will be green feed available during the greater part of the cows' lactation period, and provides pasture from which the young heifers can obtain the roughage they need. If paddocks with suitable pasture are not available for the young heifers, a supply of good hay should be made available in racks, which allows the young stock to eat at will, with the least amount of loss.

The delicate age (first four weeks).

All the well-reared dairy heifers in Western Australia are of great economic value to the State, and are prospective West Australian cows which are slowly but surely going to displace the thousands of Eastern Australian cows which are being milked daily to supply us with the dairy products that we import. There are, however, far too many poorly bred, underfed, badly-nourished, undersized, miserable specimens of dairy stock being

raised, which are not only unprofitable to the stock-raiser but a distinct menace to the successful establishment of the dairying industry. This type of badly-reared heifers invariably brings low prices, and, owing to cheapness, ultimately gravitates to the poorer struggling dairy farmer who is battling to get a herd together, and really becomes an additional mill-stone around his neck.

A dairy cow to be a profitable milk producer must be capable of consuming large quantities of suitable fodder over and above her daily maintenance ration, and the most profitable producer is one which can convert food, *over maintenance*, into milk. A good cow, therefore, must have a large capacity and her digestive organs become abnormally developed. The heifer, therefore, should be reared on the lines of building up a large, strong, healthy frame capable of performing the great functions required of her when she becomes a producer. If a heifer is badly reared, especially when wrongly or insufficiently fed, her frame and constitution suffers and her digestive organs do not grow but remain undersized. The majority of stunted, weak-constitutioned young stock so often seen are the result of the lack of protein foods, namely, foods such as bran, crushed oats, lucerne, clover and peas.

The great majority of young dairy cows which are unsuitable are the result of neglect between "weaning" and "breeding" ages, and even right up to springing are many simply turned out to "bush" and allowed to fend for themselves on unsuitable and insufficient feed. The average bush feed sadly lacks protein food, and contains an abundance of indigestible fibre.

The skim-milk age (one to six months).

With the development of group settlements everything points to a constant demand in this State for large numbers of well-grown dairy-type heifers, for many years to come, at reasonable prices to the breeders, but the prevalence of many undesirable heifers has inspired the writer to offer advice on the proper rearing, and, at the same time, to urge the breeding and rearing of dairy heifers in Western Australia. It is, without doubt, desirable that young heifers should be well bred, and, as such, they would command higher prices than poorly-bred animals, but nevertheless, in view

of the necessity of many more dairy cows in Western Australia, it is highly desirable that all heifers be raised to a productive age. The improved "dairy" breeding will be obtained from their progeny by reason of the Government's policy of the use of pure "tested" dairy sires.

In outlining the rearing of dairy heifers it is recommended that the calf should be taken from the mother within a few days after birth. This is better for both, as it will make it easier for the mother and will avoid her fretting unduly, and the calf will learn to drink quicker than if allowed to remain on the dam over long.

It is important that the calf should receive its mother's milk for the first week at least. The "colostrum" or first milk of the cow is of special advantage and a necessity to the calf's digestive system, it having a cleansing and laxative effect on the stomach and bowels. Whole milk-feeding should continue for another week or fortnight, thence a gradual reduction in the whole milk should take place and the difference be made up with skim milk until, at the end of about one month or five weeks, the calf will be receiving

The oft-neglected age (six to 15 months).

no milk other than skim milk. The addition of calf food, such as Meggitt's Meal or specially prepared calf foods in quantities as prescribed by the makers, is recommended to make up the deficiency of fat in skim milk. A very suitable mixture may be made by boiling together one part linseed meal and two parts pollard and adding about one pint of the porridge-like mixture to the skim milk. One ounce of lime water per day is beneficial in counteracting stomach acidity, thus preventing "scours."

Feeding should be at frequent intervals especially in the case of young calves, and at least three times a day is recommended. In nature the calf obtains drinks at fairly frequent intervals, but the feeding of whole rich milk is not desirable and is often the cause of digestive troubles. A calf reared on its mother in the natural state, as with the beef breeds, receives a milk which is, as a rule, low in fat content as compared for instance with Jersey or Guernsey milk. The regularity of time of feeding, temperature of

feeding, and cleanliness in all particulars are *essential* in the rearing of the calf, and the *prevention* of the most dreaded of all calf diseases, namely, "scours." Without doubt, prevention of "scours" is the best cure. The quantity of milk fed should vary from about 10lbs. to 18lbs. per day, according to the capacity of the calf, but in no circumstances should the calf receive the utmost it can drink.

The feeds recommended to supplement and be fed with skim milk have been referred to. In addition, grains such as crushed oats, barley, with a little bran in troughs for the calves to pick up after feeding with milk, are strongly recommended. Where clover-hay, pea-hay, and lucerne-hay can be grown, it should be conserved and placed in racks to be fed to calves as they grow older. Leguminous hays are, without doubt, the best foods for young stock, and, where it can be grown, the advantage should be availed of.

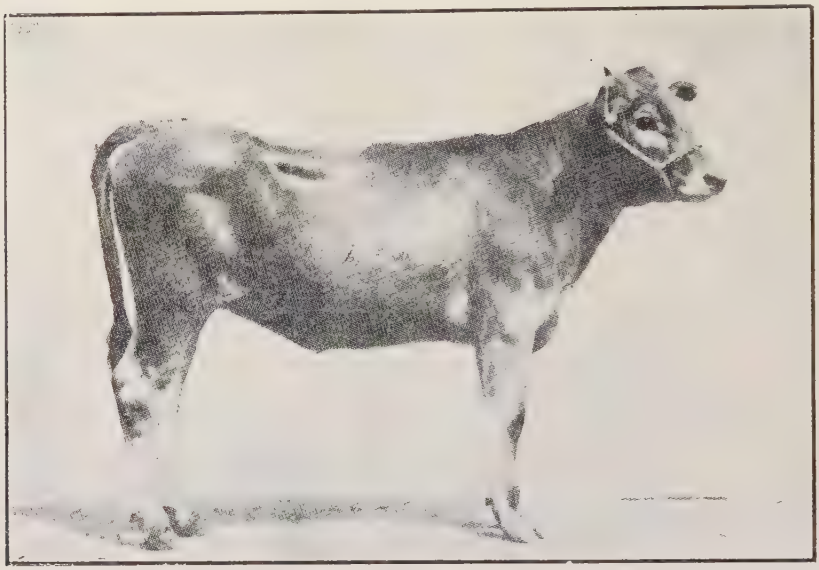
The breeding age (15 to 22 months).

A very interesting and valuable experiment conducted at Woburn in England, showing the most profitable method of feeding calves with additions of skim milk, is as follows:—

	Food.	Gain per calf per week.
		lb.
Lot 1	Cod Liver Oil	9·66
Lot 2	Calf Meal	8·66
Lot 3	Gruel	8·33
Lot 4	Whole Milk	12·83
Lot 5	Crushed Oats	13·30

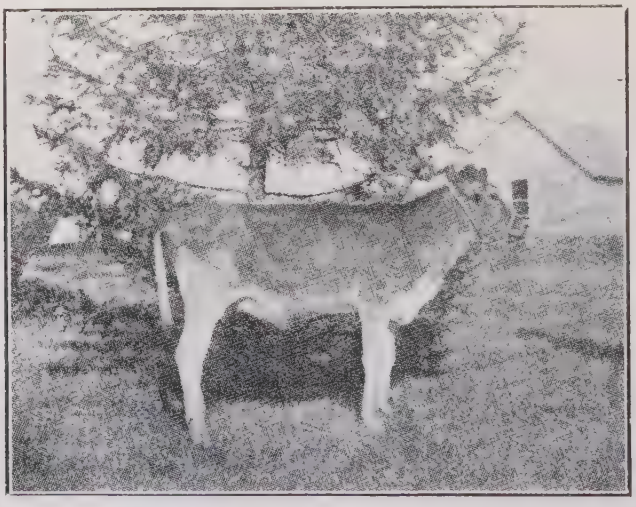
The calves, when three weeks old, were put on the various foods, and it will be seen that crushed oats gave the highest gain in live weight. The next highest gain was with whole milk, but the cost of the gain was altogether too expensive. The oats were not ground finely but were merely bruised as is ordinarily done on our farms for feeding horses.

Another series of experiments conducted by Woll and Voorhies in California (Bulletin No. 271) concludes that "vigorous thrifty calves of satisfactory body weights can be readily raised on separated milk, grain feeds, and hay."



This heifer is in good growing condition (aged one year).

Crushed grain, such as oats or barley and bran, should be fed always in troughs, following the feeding of skim milk. Such feeding subsequent to a drink of milk also has the advantage of eliminating the desire of suck, so



This heifer is too low in condition.

prevalent among calves. Cereals contain a large amount of carbo-hydrates or starch which must be masticated and mixed with saliva to be properly digested. If fed with milk, the grain is bolted into the stomach and the majority passes through undigested.

This heifer carries too much condition.

Calf-feeding bails are a distinct advantage where large numbers of calves are fed, as they permit of definite quantities to be fed to each calf

Calves reared under good conditions.

with no likelihood of the milk being knocked over, and, if the calves are penned up for, say, twenty minutes after the feeding of milk and then are given grain, the tendency to suck one another will go off. Where only a few young calves are being fed it is of advantage to tie them up, but in all cases provision should be made for proper shade in the summer and shelter in the winter.

Tied calves should be moved frequently to clean pastures to avoid the ground becoming foul, which otherwise would obtain if constantly tied in one place. Access to pastures, if possible, at all times is highly desirable.

Calves and young stock should not run with full-grown stock. Where large numbers of calves are reared it is of distinct advantage to grade according to size and age into separate paddocks, and all changes of feed should be gradual.

Calf-feeding bails.

Silage is of great value in feeding calves after they have reached the age of three months. A small quantity should be fed at first and gradually increased. It is of particular advantage in districts where pasture is not available.

Dairy heifers are expected to gain at least 1lb. per day up to three months, and average slightly more than 1lb. per day gain from birth to one year. It is inadvisable to allow young heifers to get over-fat, as, apart from the fact that it tends to beefiness and lack of milk production, there is also the danger that they will be non-breeders.

CONCLUSIONS.

All dairy heifers are of great potential value to Western Australia:—

Well-reared heifers grow to full size.

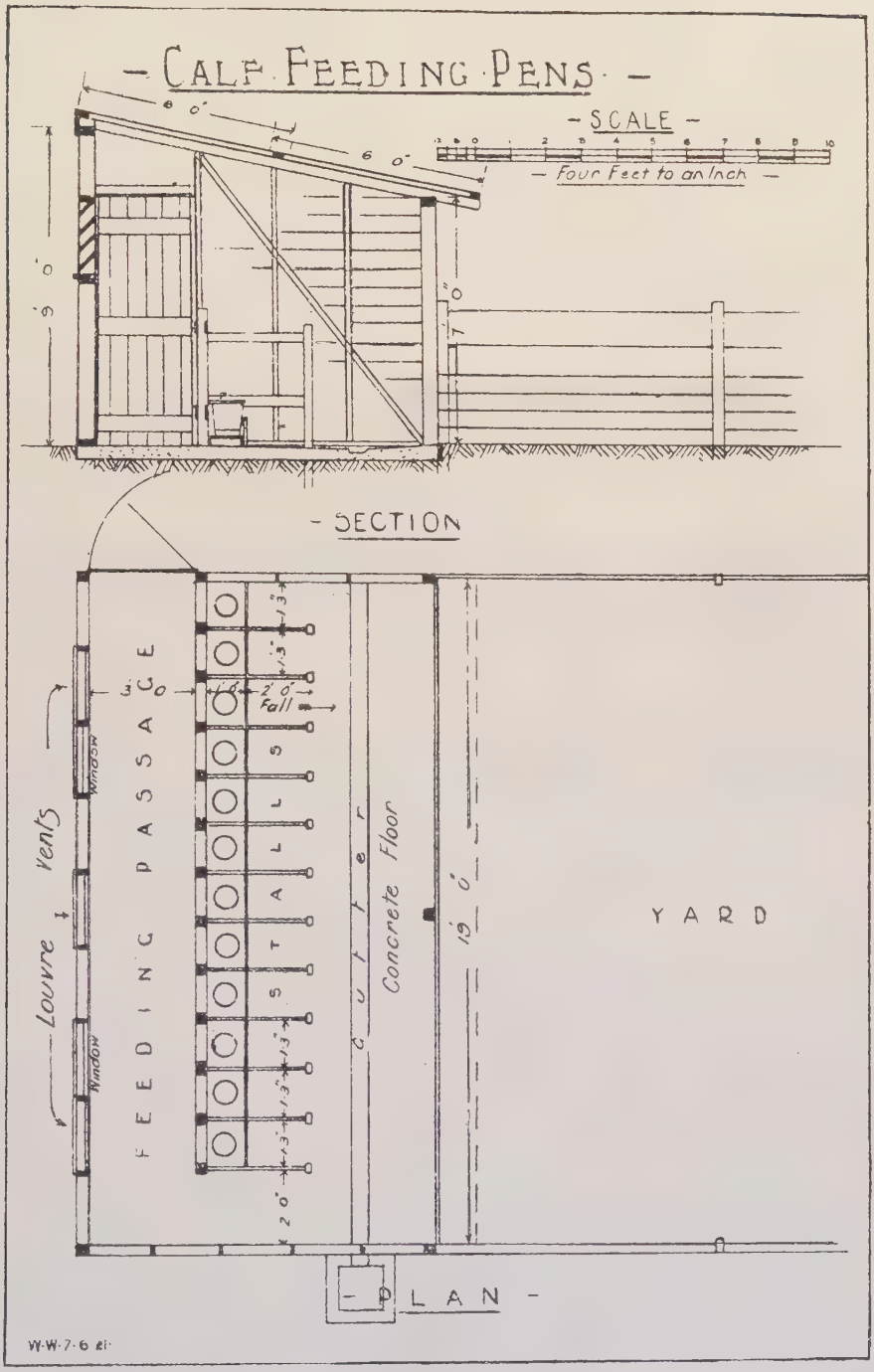
Well-reared heifers reach maturity at a comparatively early age.

Well-reared heifers possess capacity for feed, vigour, and constitution.

Well-reared heifers are likely to be profitable producers of calves and milk.

Well-reared heifers command highest prices from buyers.

Feeding and care represent 75 per cent. of the heifer's worth.


CALF FEEDING PENS
SCALE
Four Feet to an Inch
6' 0"
6' 0"
9' 0"
SECTION
FEEDING PASSAGE
3' 0"
2' 0" Fall
STALLS
Gutter
Concrete Floor
19' 0"
YARD
Louvre Vents
Window
Window
2' 0"
PLAN
W.W.7.6.21

HERD TESTING.

THE OFFICIAL AUSTRALIAN PURE BRED DAIRY CATTLE PRODUCTION TESTING SCHEME.

Conducted by Dairy Branch, Department of Agriculture, Western Australia—Results for the Year ended 30th June, 1925

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.	Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.
				yrs. mth.			lbs.	%	lbs.	lbs.
MATURE COWS—STANDARD REQUIRED, 350LBS. BUTTER FAT—273 DAYS.										
Maranora of Tellaraga	R. H. Rose	Jersey	6707	7 2	16–5–24	273	11,509	5·04	580·48	26½
Yarraview Bonnie Annie	A. W. Padbury	Guernsey	574	6 11	23–6–24	273	8,656	6·39	553·53	25½
Fairy of Dardanup	R. H. Rose	Jersey	8492	6 4	20–5–24	273	11,235	4·80	539·41	30
Girlie of Sarnia	D. Malcolm	do.	9992	5 9	21·8 24	273	10,039	5·11	513·12	26½
Campanilles Maid of Garden Hill	R. H. Rose	do.	8935	10 5	11-11-23	273	9,235	5·53	511·18	30½
Fancy of Liryclea	A. H. Henning	do.	6674	6 10	24–7–24	273	9,114	4·83	437·40	23
Lady Fowler 4th of Dardanup	D. J. Goyder	do.	10004	7 2	20–11–23	273	7,846	5·42	425·72	23
Silver Bell of Roelands	A. H. Henning	do.	10047	6 5	20 7-24	273	8,397	4·82	405·14	19
Wild Rose, II. of Garden Hill	W. Padbury	do.	10091	7 2	7–10–23	273	6,534	5·77	377·03	9½
Noreen V. of Banyule	do.	do.	7125	5 5	7–10–23	273	5,713	6·07	346·96	14
Ettie IV.	do.	do.	2889	13 1	4–10–23	273	7,683	4·44	341·43	15
Lady Betty II. of Koogan	A. W. Padbury	Guernsey	872	6 7	23–6–24	273	7,728	4·27	330·07	16
Cheerful II. of Yarralla	A. H. Henning	Jersey	6258	7 8	17–10–23	273	5,799	5·57	323·29	17
Mokine Picotee	Walker & Co.	do.	8486	7 2	22–7–24	273	5,436	5·90	321·02	12
Creamy of Calcamine	G. C. Spencer	do.	10631	5 2	16 8-24	273	5,113	6·03	308·33	9½
Gladness of Woollongbar	Department of Agriculture	Guernsey	452	5 5	25–9–23	273	5,967	4·88	291·45	16
Duchess of Calcamine	G. C. Spencer	Jersey	10093	5 9	13–5–24	240	4,065	6·00	244·14	6½
Milkmaid 1st of Blackheath	H. O. Simms	M.S.	10091	5 10	15–5–24	240	5,505	3·73	205·32	18
Lady Fowler 5th of Dardanup *	D. J. Goyder	Jersey	9990	6 8	26–5–24	90	2,550	4·79	122·37	27
SENIOR 4 YEARS OLD (OVER 4½ YEARS AND UNDER 4½ YEARS)—STANDARD REQUIRED 325LBS. BUTTER FAT.										
Mokine Fancy	T. H. Wilding	Jersey	8484	4 7	11–8–24	273	8,641	5·83	504·47	10½
Bolebek Judith	A. L. B. Lefroy	Fresian	291	4 9	23–5–24	273	14,164	3·16	448·72	36½
Milton's Syringa	A. W. Padbury	Guernsey	503	4 7	4–12–23	273	6,465	6·22	402·07	16
Mokine Woodbine	T. H. Wilding	Jersey	8487	4 11	5–9–24	273	6,901	5·63	388·84	15½
Lady Fowler 7th of Dardanup	T. L. Rose	do.	10006	4 11	1–11–23	273	7,188	5·11	367·73	20
Bolebek Dorothea	A. L. B. Lefroy	Fresian	293	4 9	14–4–24	273	7,306	3·78	276·88	15½
Retford Tessie	W. Padbury	Jersey	8464	4 7	10–10–23	183	2,952	5·53	163·28	9
Yarraview Georgina †	A. W. Padbury	Guernsey	782	4 8	18–6–24	30	825	5·12	42·27	27½

JUNIOR 4 YEAR OLD (OVER 4 YEARS AND UNDER 4½ YEARS)—STANDARD REQUIRED, 300LBS. BUTTER FAT.

Lady Fobes Veeman	A. L. B. Lefroy	Fresian	620852 U.S.A.	4	5	11–4–24	273	16,533	3·17	524·88	46
Daisy Vale of Grass Vale	R. H. Rose	Jersey	8474	4	2	4–2–24	273	8,143	5·71	465·45	30½
Bolebek Joy	A. L. B. Lefroy	Fresian	1117	4	4	24–9–24	210	9,840	3·79	343·26	28½
Mokine Malmaison	Walker & Co.	Jersey	11724	4	2	7–10–24	273	5,821	6·16	358·93	10½
Lady Fowler 10th of Dardanup	R. H. Rose	do.	10009	4	2	25–12–23	273	6,297	5·12	322·62	14½
Bolebek Frieda	A. L. B. Lefroy	Fresian	1116	4	1	17–2–24	273	8,664	3·50	303·79	23
Rocket of Wollongbar	Department of Agriculture	Guernsey	541	4	5	14–10–23	273	6,018	4·85	291·89	12
Gentle of Blackheath	D. Malcolm	M.S.	11679	4	2	19–11–23	273	5,269	4·15	220·25	5
Vanity VII. of Oakdale	H. O. Timms	do.	...	4	2	5–3–24	240	3,750	4·20	157·71	9

SENIOR 3 YEAR OLD (OVER 3½ YEARS AND UNDER 4 YEARS)—STANDARD REQUIRED, 275LBS. BUTTER FAT.

Jean II. of Grass Vale	R. H. Rose	Jersey	9996	3	10	5–6–24	273	8,248	6·01	495·72	19½
May of Blackheath	Wooroloo Sanatorium	M.S.	N.Y.A.	3	9	31–8–24	273	12,156	3·99	485·14	22
Treasure III. of Homeleigh	D. Malcolm	I.M.S.	4648	3	9	21–10–23	273	8,829	4·68	413·77	22½
Mokine Empire Lily V.	T. H. Wilding	Jersey	10635	3	9	20–5–24	273	5,197	6·99	363·41	12½
Virginia of Nundorah	A. W. Padbury	Guernsey	778	3	10	5–8–24	273	5,713	5·45	312·37	14½
Bolebek Dulcena	A. L. B. Lefroy	Fresian	1120	3	9	26–4–24	273	8,475	3·62	307·16	25
Mermaid of Blackheath	D. Malcolm	M.S.	12156	3	11	1–12–23	273	4,745	4·09	194·20	13

JUNIOR 3 YEARS OLD (OVER 3 YEARS AND UNDER 3½ YEARS)—STANDARD REQUIRED, 250LBS. BUTTER FAT.

Picton's Trequean Flirt	A. W. Padbury	Guernsey	747	3	3	18–6–24	273	9,093	4·94	449·81	31
Lily of Grass Vale	R. H. Rose	Jersey	8947	3	4	6–1–24	273	8,772	5·03	442·87	32
Lady Fowler 13th of Dardanup	D. Malcolm	do.	8986	3	5	13–7–24	273	7,981	5·53	441·27	20½
Lady Fowler 12th of Dardanup	R. H. Rose	do.	10011	3	3	6–2–24	273	8,065	4·81	388·15	24
Daisy 2nd of Garden Hill	Walker & Co.	do.	10629	3	5	2–9–24	273	6,759	5·20	352·06	23
Lady Fowler 17th of Dardanup	R. H. Rose	do.	11695	3	1	17–9–24	273	5,844	5·79	338·59	18
Madge II. of Dalebank	D. Malcolm	do.	8449	3	3	1–12–23	273	5,180	6·36	329·80	18
Bolebek Roma	A. L. B. Lefroy	Fresian	1124	3	4	7–4–24	273	8,286	3·75	310–91	22
Velvet of Wollongbar	Department of Agriculture	Guernsey	774	3	5	19–10–23	273	5,703	4·45	242·79	8
Primrose of Calcamine	G. C. Spencer	Jersey	10062	3	2	14–8–24	273	4,117	5·83	240·18	7½
Handsome Girl of Calcamine	do.	do.	10061	3	2	5–5–24	240	3,165	6·55	207·51	5½
Honey of Blackheath	H. O. Timms	M.S.	11766	3	5	15–4–24	273	5,307	3·57	189·68	14
Thelma of Blackheath	do.	do.	12847	3	5	13–3–24	240	3,600	4·10	147·90	10½
Lady Betty of Koogan †	A. W. Padbury	Guernsey	655	3	2	11–6–24	30	780	4·33	33·78	26

SENIOR HEIFERS (UNDER 3 YEARS AND OVER 2½ YEARS).—STANDARD REQUIRED 225LBS. BUTTER FAT.

Milton's Dulcie II.	A. W. Padbury	Guernsey	928	2	8	14–4–24	273	8,571	5·06	433·93	27
Lady Fowler 11th of Dardanup	T. L. Rose	Jersey	10010	2	11	14–12–23	273	6,996	5·76	403·42	19
Milton's Daisy II.	A. W. Padbury	Guernsey	922	2	11	18–6–24	273	6,976	5·39	376·19	15½

* Withdrawn. † Sold.

HERD TESTING—continued.

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.	Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.
SENIOR HEIFERS (UNDER 3 YEARS AND OVER 2½ YEARS—STANDARD REQUIRED 225LBS. BUTTER FAT.—*continued.*										
				yrs. mth.			lbs.	%	lbs.	lbs.
Dinah II. of Wollongbar	Department of Agriculture	Guernsey	832	2 8	2-10-24	273	7,089	5·1·9	367·95	23
Dunalister Manakin Perees Capture II. ...	R. H. Rose	Jersey	10392	2 9	13-6-24	273	5,652	6·05	342·20	9
Sheila of Sarnia	D. Malcolm	do.	8452	2 11	16-10-23	273	5,392	6·21	334·99	14
Colleen of Rosewood	A. W. Padbury ...	Guernsey	819	2 7	14-8 24	273	5,673	5·61	318·40	16
Mokine Noble Lily...	Walker & Co.	Jersey	11795	2 9	12-8-24	273	6,367	4·85	308·74	17½
Netherland Johanna of Lydholme ...	A. L. B. Lefroy ...	Friesian	1355	2 11	1-10-24	210	8,055	3·65	295·35	27½
Netherland Colanthe Princess of Lydholme	A. L. B. Lefroy ...	Friesian	932	2 10	6-7-24	273	7,200	3·69	266·28	10
Gladness II. of Wollongbar	Department of Agriculture	Guernsey	631	2 7	27-11-23	273	4,299	5·77	248·39	12
Blossom of Calcamine	G. C. Spencer	Jersey	10058	2 11	15-5-24	273	4,465	5·44	243·19	8½
Junket of Koogan †	A. W. Padbury ...	Guernsey	654	2 9	2-3-24	150	3,148	4·91	154·78	17
Beauty of Sarnia	D. Malcolm	Jersey	12086	2 9	3-5-24	273	2,325	5·61	130·55	5
JUNIOR HEIFERS (UNDER 2½ YEARS).—STANDARD REQUIRED, 200LBS. BUTTER FAT.										
Mokine Empire Lily VII.	T. H. Wilding	Jersey	11794	2 5	14-2-24	273	6,755	5·84	388·31	23
Golden Pearl 4th of Wollongbar ...	Department of Agriculture	Guernsey	863	2 4	8-6-24	273	6,882	5·60	385·79	19
May Queen of Sarnia	A. H. Henning ...	Jersey	12089	2 4	15-9-24	273	5,734	6·21	356·35	16½
Madge of Sarnia	D. Malcolm	do.	13437	1 9	15 5-24	273	5,863	5·74	336·97	19½
Mokine Clove Carnation	Walker & Co.	do.	11796	2 4	2 4-24	273	4,779	6·70	320·52	13
Lily's Gem of Grass Vale	R. H. Rose	do.	15698	1 8	27-9-24	273	5,758	5·10	293·43	14½
Jessica of Grass Vale	do.	do.	...	2 0	10-9 24	273	6,027	4·75	286·39	14
Lilly Rye of Grass Vale	do.	do.	...	2 0	5-10-24	273	5,208	5·47	285·17	16
Noraleda II. of Roelands	do.	do.	14337	2 5	22 8 24	273	4,996	5·61	280·55	10½
Rye Cream of Grass Vale	do.	do.	...	1 11	27-9-24	273	4,843	5·73	277·78	14½
Makanora of Grass Vale	do.	do.	12257	2 3	19-9 24	273	5,373	5·10	273·06	16
Nymphea of Juadine	Walker & Co.	do.	12081	2 2	11-7-24	273	4,444	5·87	261·15	11½
Lady Rye of Grass Vale ‡	R. H. Rose	do.	...	1 8	1-10-24	240	5,025	4·93	248·01	12½
Lonesome of Calcamine	G. C. Spencer	do.	13439	2 0	6-7-24	273	3,808	5·82	221·86	4½
Queen of Sarnia	D. Malcolm	do	12091	2 4	15-12-23	273	4,173	4·92	205·37	13

Carnation 3rd of Greyleigh	...	...	do.	...	I.M.S.	...	...	2	0	18–1–24	273	5,600	3·49	195·51	12
Myrtle 12th of Greyleigh	...	...	do.	...	do.	...	...	2	3	26–4–24	273	4,557	4·04	184·49	4
Mariposa of Yarralia *	...	...	A. H. Henning	...	do.	...	...	2	1	4–11–24	210	3,060	5·85	163·71	4
Girlie III. of Sarnia	...	...	D. Malcolm	...	do.	...	12087	2	3	24–7–24	210	1,950	6·13	119·58	5
Peeress of Jaudine *	...	...	Walker & Co.	...	Jersey	...	13440	1	9	22–8–24	90	1,215	6·37	77·49	11
Bonnie Margaret of Koogan *	...	...	A. W. Padbury	...	Guernsey	...	808	2	0	16–5–24	30	480	6·23	29·94	16
Lady Fobes Veeman	...	...	A. L. B. Lefroy	...	Friesian	...	620852 U.S.A.	4	5	11–4–24	365	20,130	3·28	660·24	39
Girlie of Sarnia	...	...	D. Malcolm	...	Jersey	...	9992	5	8	21–8–24	365	12,750	5·17	660·00	27
Fancy of Liryclea	...	...	A. H. Henning	...	do.	...	6674	6	10	24–7–24	365	11,210	4·91	550·57	25
Lady Fowler 14th of Dardanup	...	...	R. H. Rose	...	do.	...	12093	1	11	30–8–23	365	9,365	5·57	521·86	20½
Morden Lady of Koogan	...	...	A. W. Padbury	...	Guernsey	...	722	3	1	23–9–23	365	12,181	3·81	502·59	31
Golden Pearl 4th of Wollongbar	...	...	Department of Agriculture	...	do.	...	863	2	4	8–6–24	365	8,665	5·80	502·48	20
Annetta III. of Wollongbar	...	...	do.	...	do.	...	589	2	8	2–9–23	365	6,589	6·07	406·37	18
Gladness of Wollongbar	...	...	do.	...	do.	...	453	5	5	25–9–23	365	7,470	5·05	377·31	16
Rocket of Wollongbar	...	...	do.	...	do.	...	541	4	5	14–10–23	365	7,244	4·91	355·09	14

* Withdrawn. † Sold. ‡ Died.

THE APPLICATION OF THE LABORATORY TO THE PROBLEMS OF STOCK DISEASES.

H. W. Bennetts,
Veterinary Pathologist.

A Veterinary Pathological Laboratory has recently been commenced in connection with the Agricultural Department of this State.

It does not seem out of place, at this early stage of its development, to briefly state the uses and methods of such a branch, and more particularly to put before the section of the public most likely to benefit by its existence the most satisfactory methods of furnishing material for laboratory examination.

With regard to its essential uses, such a laboratory is primarily for the diagnosis, or definite confirmation, of the diagnosis, of known stock diseases, and for research into the cause, prevention and treatment of unknown stock diseases. Research methods may also be applied to various phases of known stock diseases where our knowledge is as yet incomplete.

A laboratory may be used for more specialised purposes, for example, the preparation, on a more or less large scale, of biological products—vaccines, serums, toxins, etc.

It is very often impossible to definitely determine the nature of a disease process without the application of laboratory methods, and even then information of any value can only be obtained when the right materials are submitted for examination. Pathological and other specimens of interest forwarded to the laboratory will always be appreciated and a diagnosis will be supplied where possible.

1. *Disease Specimens—How and what to send.*—In the case of outbreaks of disease in stock, where possible, veterinary advice should be obtained or information supplied to the Stock Branch regarding the history of the affection so that stock owners may be advised specifically what to look for, and what specimens to collect for subsequent laboratory examination. However, it were well to note, especially when the diagnosis of specimens from a single animal may be required, particulars which may be of some guidance in this regard. In all cases full information should be furnished with the specimens:—

(a) Live subjects.—In the case of outbreaks of stock disease if it be possible to despatch a sick animal to the laboratory the greatest possibilities are given for a dignosis. This method is especially applicable when the distance from Perth is not very great, or if the period of sickness is likely to be sufficiently long to allow of the patient reaching the laboratory before death, or soon after death occurs. It is of course inapplicable when there is any chance of the contagion being spread to other animals during transit.

(b) Whole carcass.—The sending of the whole carcass is of value when it can be made to reach the laboratory a few hours after death, though in some bacterial diseases, where putrefaction is rapid, *post mortem* changes may mask the cause.

(c) Parts of the carcass.—Very often neither (a) nor (b) are practicable, and are even unnecessary. A definite diagnosis may often be made from specimens collected by the owner following the directions given hereunder:—

A *post mortem* examination should be made as soon after death as possible. Specimens collected immediately after death are of most value.

Any abnormal organs or parts of organs should be sent in preservative to the laboratory for examination, accompanied by particulars as to their appearance, size, colour, consistence, etc., when fresh.

Large specimens should be immediately put into five per cent. formalin solution (that is formalin five parts, water 95 parts) and despatched in a water tight container. If it is desired to send the entire intestines, etc., they may be packed in a kerosene tin with a piece of absorbent material soaked in formalin.

Usually a small portion of one of the diseased tissues, for microscopic examination only, is sufficient. For this purpose slices about quarter of an inch thick should be placed immediately in a 10 per cent. formalin solution (*i.e.*, double the strength mentioned above) in a wide-mouth bottle, corked, packed and posted to the laboratory. If possible slices should be cut so as to include a piece of the normal as well as the abnormal tissue.

(c) Smears.—In addition to preserved specimens of diseased tissues smears of pus (if present), and blood smears, often provide useful information. As a general rule blood smears alone do not provide sufficient evidence for a definite diagnosis to be made. Smears should be made by spreading a very little of the material (a very small drop of blood) as thinly as possible on a clean microscopic slide, or a piece of clean window glass, by means of another glass slide or a cigarette paper. Smears should be dried in air (being protected from flies) and packed carefully, and so that they do not stick together.

(d) Fluids, etc., for bacteriological examination.—These are to be collected in pasteur pipettes, which may be supplied, with directions as to their use, in special instances.

(e) Blood samples.—Some diseases, notably contagious abortion in cattle may be recognised by the presence of various agents in the blood serum of the live carriers of the infection. In the event of blood required for these seriological tests, samples are collected as follows:—Sufficient blood may be obtained from most animals either by nicking with a sharp knife one of the larger blood vessels in the ear, or by making a short incision along the length of the under surface of the tail (in the pig the end of the tail is cut off) the blood being made to drip into clean glass bottles (1oz.). Bottles should not be more than two-thirds full. They should be then corked, labelled and despatched as soon as possible.

2. *Laboratory Diagnostic Methods.*—Having given some idea how specimens are collected for pathological and bateriological examination, it will probably be of interest to give a brief outline of the processes whereby one arrives at a diagnosis, viz., routine laboratory methods. These ordinary routine methods may be applied to research problems, as well as to diagnostic work, though often more special work is needed.

(a) Macroscopic examination, *i.e.*, naked eye appearance.—The nature and distribution of lesions (*i.e.*, alteration in structure and function of various parts of the body) may sometimes be sufficient to determine the disease. Usually, however, microscopic examination has to be resorted to, at least to confirm the diagnosis.

(b) Microscopic examination.—The smears previously referred to may be stained with various dyes and examined forthwith, but pieces of organs, etc., have to be specially prepared for cutting into very fine sections. They are then fixed on to glass slides, stained and examined microscopically, one being able thereby to see what alterations in structure have occurred; and often, also, to arrive at the cause of the same. It may, however, be necessary to go still further, and in bacterial diseases adopt cultural methods, viz., to grow the organisms.

(c) Cultural methods.—Material is collected in a sterile fashion and various culture media are inoculated with some particles of the organisms contained in the diseased tissues, and are grown in tubes. Many different nature material are used (broth, milk, serum, potato, etc.), and often the cultures obtained on these are so characteristic (macroscopically and microscopically) that nothing further is needed.

(d) Animal inoculation.—It is, however, often necessary to proceed to animal inoculation in order to test the pathogenicity (*i.e.*, disease producing power) of the bacteria. It may be in small laboratory animals (guinea pigs and rabbits) or possibly in healthy animals of the same species as that from which the infection was recovered.

(e) Bacteriological tests.—The blood serum from animals with certain diseases may act characteristically upon the bacteria previously recovered from an infected animal and grown in the laboratory in a tube. Thus it is possible to determine, in the laboratory, the existence of certain diseases by means of blood samples taken from animals carrying the infection.

BREEDING LAMBS FOR MARKET.

Fat lamb production is usually a profitable occupation, either in the permanent flock or when sheep are obtained for the purpose of breeding a lamb and then being disposed of. There are two essential factors—

(a) The farm must be within easy distance of the railway, and

(b) A supply of feed must be assured so that the lambs grow quickly.

In Western Australia this branch of the sheep-raising industry has a great advantage, in that it can be undertaken at a moderate outlay of capital. Although the local demand is comparatively small, a lucrative export trade could be built up. For the purpose of raising a lamb or two, old ewes are better than young ones, indeed they are to be preferred: they are very much quieter and they can be purchased for much less money than young animals. There are, however, old ewes and *old ewes*. The buyer, therefore, must be careful to avoid sheep which, though not very old, may be undesirable. Amongst the old ewes there is a much better choice than amongst the young ones. Cast for age ewes from a good flock can be obtained, but an owner cannot be tempted to sell desirable young ones. Old Merino ewes appreciate a quiet life much better than the younger sheep; with kind treatment, quietness, and ample feed they improve wonderfully. It is wise, however, not to keep them for more than one or two seasons.

In selecting the ewes all that is required is to see that they are large-framed, and of good sound constitution.

The choice of the rams requires the exercise of care and judgment. For lamb breeding no rams are as suitable as those of the Downs breeds, and of these the Dorset Horn, Shropshire, and South Down are the best. Border Leicester, Lincoln, and Romney Marsh, however, are all serviceable sheep for this purpose.

A coming producer of fat lambs is the Corriedale. The reputation this breed has made abroad has excited the envy of sheepmen.

The Romney Marsh sheep are very useful for raising lambs in cold exposed situations, as their progeny are very hardy, grow well, and fatten rapidly. There is this objection, however, to crossing with merino ewes—the lambs' heads are so large that many of the ewes die in lambing. This trouble is not experienced if cross-bred ewes are used. The Border Leicesters will prove serviceable almost anywhere.

In selecting the sires, size, shape, and a tendency to early maturity are much more important points than the quality or even the quantity of their wool.

Rams of any of the breeds named as suitable to mate with Merino ewes will answer quite as well when mated with cross-bred ewes.

It is better to pay a good price when procuring a ram for this purpose, and get one from a high-class stud that has an established reputation for soundness of constitution and early maturity: an extra pound or two laid out in the purchase of a pure-bred sire is money well spent, even to breed cross-bred lambs. The farmer should of all things avoid an undesirable

ram: he, having no type with which to stamp his progeny, cannot be depended upon and will prove in the future, as he has done in the past, a disappointment to the owner.

When purchasing a draft of ewes for the purpose of raising lambs for market, large-framed merinos will be found to be cheaper, and, in most districts more suitable, than cross-bred ewes. Pure-bred long-wool ewes are too dear to be available.

In breeding lambs for the market, strength of constitution is just as much required in the stock as in breeding a permanent flock. A sturdy, well-shaped lamb will thrive from the first, whilst a weakly one will be a useless encumbrance upon which good food will be thrown away. It is of the greatest importance that the lamb should continue to thrive from the date of birth until time of sale to the butcher.

For lamb breeding, merino ewes are more useful than long wools or crossbreds, as they take the ram more readily and can thus be used for producing lambs at any required season.

SHEEP PASTURED IN WESTERN AUSTRALIA.

Hugh McCallum,
Sheep and Wool Inspector.

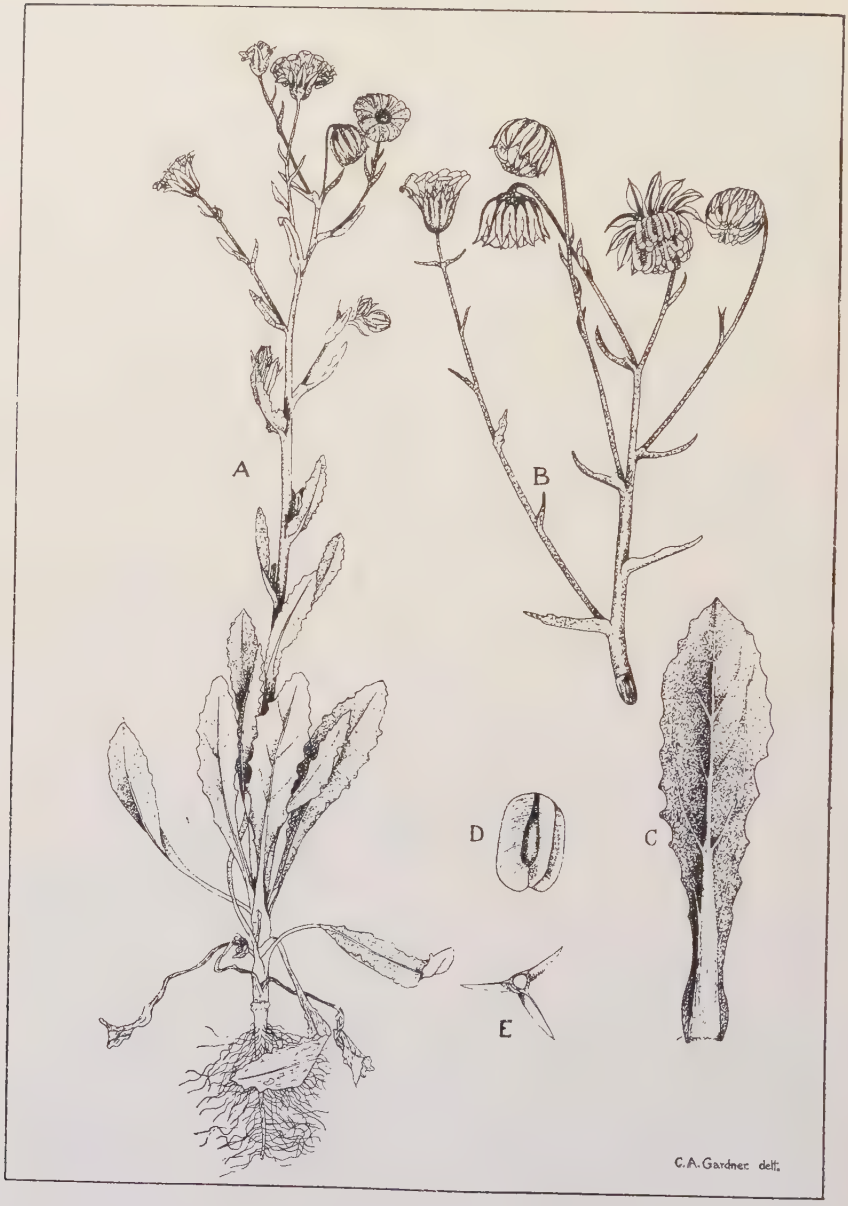
Considering the enormous tract of undeveloped country we have in this State suitable for pastoral pursuits, there is no part of the Commonwealth that should be brought more prominently before the outside world in regard to possibilities for settlement.

The following figures, taken from a return issued by the Government Statistician, Mr. S. Bennett, show the number of sheep pastured in the State as at the 31st December, 1923 and 1924:—

Victoria	1,114,677
Swan	57,025
Wellington	63,950
Sussex	62,161
Northam	387,476
York	263,805
Beverley	182,410
Pingelly	112,725
Wickepin	81,796
Narrogin	174,928
Lake Grace	50,228
Wagin	196,252
Dumbleyung	91,188
Katanning	308,018
Tambellup	289,869
Plantagenet	81,456
East Kimberley	965
West Kimberley	123,742
North-West	1,167,946
Gascoyne	889,970
Murchison	277,436
East Murchison	27,526
Magnet	285,590
Margaret	13,116
North Coolgardie	38,877
Yilgarn	—
Coolgardie	2,676
Eucla	3,000
Esperance	26,809
Phillips River	20,973
Totals for 1924	6,396,590
Totals for 1923	6,595,467

Western Australia has a carrying capacity for more than double this number, and with improved flocks and methods the revenue of the State from this source would be materially increased.

It will be seen that the figures show a decrease of approximately 200,000 sheep for 1924 as against 1923. This was mainly due to the necessity to reduce the flocks pastured in the North-West owing to the continued bad season, and it is hoped that the re-stocking during 1925 will show a large increase on the 1923 numbers.



STINKING ROGER.

(*Tripteris clandestina*, Less.)

A. Young plant. B. Fruiting heads. C. Leaf.
D. Fruit (''seed''). E. Fruit in transverse section.

STINKING ROGER.

(*Tripteris clandestina, Less.*)

W. M. Carne, F.L.S., and C. A. Gardner.

This common weed is an annual herb well established in Western Australia. Its original home in South Africa, where it is very common, particularly around Capetown. The date of its introduction into Western Australia is not known, but is prior to 1863, plants having been collected in the Swan River district by James Drummond, the first Colonial Botanist, before that date.

As far as we know this plant has not made its appearance in any of the Eastern States, being confined to the Agricultural and Eastern Goldfields districts of Western Australia.

The generic name *Tripteris* means "three-winged," and is applied to the seed-like fruits; *clandestina* refers to something concealed, probably the flowers, which are almost covered by the semi-transparent bracts of the head. The common name of "Roger" is obscure, but the fact that the plants are strongly and rather disagreeably scented accounts for the name "stinking."

Stinking Roger is now one of the commonest of our weeds. It is particularly abundant in the Wheat Belt where sometimes it invades wheat paddocks almost to the exclusion of the crop. It thrives better in the light lands than in the heavier forest soil where usually it is uncommon. Although an objectionable weed it has the redeeming feature that stock will eat it when it is young, especially when feed is scarce. If there is other more attractive feed they will avoid it. In the drier areas, therefore, the plant is much less serious than in more favoured localities, where the light lands carry much early feed.

Description of Plant.—A viscid herbaceous annual with an erect stem paniculately branched and glandular-hairy. Leaves mostly basal, the lower ones four to five inches long, oblong, blunt, slightly and obtusely toothed, sparsely hairy, much narrowed towards the base; the upper leaves much smaller, and more or less clasping the stem, one to one and a-half inches long.

Flowers daisy-like, usually drooping. The exterior is composed of several scale-like bracts sharply pointed, almost transparent, with a narrow opaque greenish-purple centre. The rays of the flower-head scarcely exceed the bracts, and are yellow with purple lines underneath, and rolled outwards and backwards at the tips. The centre of the daisy is composed of several small tubular flowers of a deep purple.

The small seed-like fruits are borne in numbers inside the bracts, and are broadly three-winged, the wings being transparent. Each is one-seeded.

Flowering period September to November.

Distribution.—Stinking Roger, like the majority of daisy-like plants, is wind distributed. The light fruits (seeds) provided with wings, float in the air for considerable distances. At the same time the plant does not produce the same number of seeds as many other species of the same family (*e.g.*,

stinkwort and thistle), and the number of seeds is much fewer in the head. Its appearance, therefore, in a district is first noticed by small isolated patches which, if not kept down, may in some soils, particularly in fallowed land, or where it has gained the ascendancy over the crop, develop into a serious trouble.

The weed is most prevalent in the Avon district, where the light lands have provided a suitable environment. In the Great Southern districts it is not so common, stinkwort occupying its place. It may be found in several sandy spots around Perth and even in the Darling Range. It appears to be almost entirely absent from the extreme South-West, but has invaded the drier areas of the Eastern Goldfields and East Midlands districts.

Control.—The weed should be prevented from seeding. Small patches may be hand-pulled, or, if of small height, and feed not plentiful, fed off with sheep. If the plants are large they should be pulled up by hand. When the areas are large cultivation will prove effective, or harrowing in fallowed land. It should be remembered that the plant only lives through one season, and to prevent seeding is of the greatest importance. If allowed to seed in one paddock, it may be expected to appear elsewhere the following year. Its first appearance may be expected in fallowed land, or the lighter sandy soils.

WILD, OR SPANISH RADISH.

(*Raphanus Raphanistrum, Linn.*)

W. M. Carne, F.L.S., and C. A. Gardner.

Wild Radish is a serious pest of cultivated lands on the Western coastal plain, and the wetter parts of the Wheat Belt, being especially prolific in the Victoria district, particularly the Greenough Flats, between Geraldton and Dongarra.

This weed belongs to the Cruciferae, a family which includes such useful plants as cabbage, cauliflower, rape, turnip, and radish. Although closely related it is not, as generally supposed, a degenerate form of the common radish (*R. sativus*). Wild radish is regarded as a native of Europe originally, but it is now found in almost all temperate countries.

In badly affected areas the eradication of wild radish has become almost impossible, but by careful attention it may be controlled. Where it is still not plentiful immediate action should be taken to eradicate it before it obtains too strong a hold.

Wild radish is an annual plant germinating usually in the autumn and growing through the winter and spring. It usually matures its seeds between October and December. Some plants may germinate in the spring and the seeds of these plants, providing they have rains, or moist conditions, may germinate in the summer, producing plants which mature seeds when they are only a few inches high.

Not particular as to the soil it inhabits, wild radish grows most prolifically, and is most serious in rich heavy soils in cultivated land. Its importance varies in different seasons, the greatest growth taking place in seasons with early rains; when the rains are late the growth is quite noticeably smaller.

The injurious effects of wild radish are:—

(1) It chokes out crops and reduces the yield.
(2) Makes harvesting operations difficult; badly affected areas may have to be left untouched.
(3) Reduces the value of chaff and grain.
(4) Produces a large quantity of feed on land not in crop, suppressing the growth of plants such as clover and grasses which are valuable at a later season, when radish is useless.

No farmer will use chaff or grain from areas which he knows to be badly affected with wild radish, if he values the cleanliness of his crops. Grading of seed will not remove all the wild radish. Stock eating radish excrete a proportion ungerminated and sound.

Description of Plant.—An erect or spreading annual (rarely biennial) usually two to three feet in height, but under favourable conditions attaining a height of up six feet, much branched, with a few short transparent stiff hairs on the main stem. Leaves pinnately divided or lobed, the upper segments large and soft, the lower small. Upper leaves often small and entire.

Flowers about three-quarters of an inch long, white or pale yellow, with violet veins; calyx of four sepals, the outer two somewhat pouched at the base; petals four, spreading.

WILD RADISH.

(*Raphanus Raphanistrum*, Linn.)

A. Young branch. B. Inflorescence. C. Flowers.
D. Pod. E. Seed (enlarged).

Pods one to over two inches long, cylindrical, with a long terminal beak, more or less like a short string of beads, and breaking when ripe into several one-seeded pieces.

Flowers August to November.

Control.—The difficulties which attend the eradication of wild radish when it is once established are so great that many farmers are apt to abandon all attempts at control. The causes of such difficulties are:—

(1) The seed may remain in a sound condition in the soil for upwards of ten years at least.

(2) The ability of the plant to sucker or emit side shoots if cut down.

Eradication is a matter requiring time and close attention. Pulling by hand and hoeing are the most effective measures when the plants are sufficiently few to be so dealt with. In hoeing it is necessary to cut through the tap root three to four inches below the ground level, otherwise the plant will emit fresh growths. If the plants are in an advanced flowering stage they should be burnt, otherwise the seeds may mature on the dead plant.

The cultivation of fallowed land with a duck-foot or disc cultivator will keep the weed in check, provided that the plant has not already formed seeds.

Sheep, although they do not appear to relish the plant, will eat it when young. The late sowing of crops when possible is advised, so that the radish which commences to grow with the early rains may be destroyed by cultivation before sowing. Hay crops are preferable to growing for grain. Grain crops are preferable havested with stripper and winower rather than a harvester. The harvester discharges the radish seeds all over the area, while the stripper allows of the accumulation of radish seed at the winnowing dumps, and thus facilitates its destruction in definite small patches.

It must be remembered that once wild radish is established, each ploughing will bring up to the surface new seeds and produce a fresh crop of plants. This will continue until the seed in the soil is exhausted.

The converting of badly affected crops into silage is a remedy by which the weed may be turned into a profitable use. Radish seeds in the silage will be killed. The use of grazing crops of oats in affected areas will also help to keep the weed in check.

SUMMARY.

Control methods on one or more of the following lines should be adopted and maintained:—

(1) Pull, or hoe out all the small patches or occasional plants seen.
(2) Fallow, using sheep to keep the fallow clean.
(3) Grow crops of oats for grazing purposes, to be eaten off by sheep.
(4) Cultivate after radish appears in autumn, before sowing.
(5) Grow hay instead of grain on affected areas.
(6) Use a stripper in preference to a harvester, burning the deposits from the winnower.
(7) Make silage of crops badly affected with the weed.
(8) Sow clean seed.

JUDGING SHEEP AT SHOWS.

HUGH MCCALLUM,
Sheep and Wool Inspector.

In the spring of the year shows are held in many parts of the State, and at these one of the main sections is that of "Sheep." The position of judge of this section is a responsible one, requiring a person with knowledge, confidence, sound judgment, freedom from any leaning towards any particular type of animal and the courage to give reasons for the awards made.

There is no regular rule as to where to begin to examine a sheep, but the animals should be placed in good light in a row facing the judge. It is natural to commence at the most exposed part—the back. This is a part where a weakness might occur: if good on the back the sheep is worthy of further inspection. Standing at the rump the judge will usually commence at the top of the neck, gradually opening the wool down to the junction with the body. The next move is to examine the wither, always a suspicious place and one where most defects are found, and if satisfied with the shape of the sheep and its wool in this particular quarter the judge soon realises that he has something good in hand. The whole length of the back, right to the tail, is then inspected. Proceeding from the wither in a direct line to the shoulder point the next move will be to examine the girth coming behind down wide of the forearm. If this part is satisfactory it is a strong point in favour of the sheep. Next proceed to the sides, then to the near flank—or that part between the hind leg and the belly—then on down the thigh, especially on to the outer thigh or breech. All the exposed parts having been examined the animal is turned up so as to present a full view and easy access to the under parts. The folds on the chest and neck are looked into to see their form and covering; the arm, or elbow, receives searching scrutiny, also the brisket. A large well-developed covering of the belly is necessary, especially if there is a full continuous growth of wool and no thinness where the belly wool is connected with that part of the body wool. The face, eyes, mouth, horns, and ears must also be satisfactory and without blemish.

HOW TO HOLD A SHEEP FOR THE JUDGE.

Gentleness has a great effect upon sheep, and if they are handled quietly, with more persuasion than force, there would be no necessity for the dragging and bother which is frequently seen.

The steward, when handing over an animal, should impress upon the holders not to be rough, but to take it as quietly as possible and allow it to see the sheep in front. A further improvement would be for the steward to have a spare holder at hand, so that he could render assistance to anyone in difficulty. The animal should be approached quietly, and if any way fractious should be held securely by the horns with as little struggling as possible. To tussle unduly with a sheep sours its temper and it will become very obstinate, probably necessitating its being carried; this should be avoided if possible.

The sheep should be stood with its rump to the judge, the holder facing the animal and holding its head. If allowed the animal will settle itself into the most natural position, the judge can then without trouble examine it. If the head is held too high, or is pulled or pushed, the sheep becomes restless and uneasy, causing the holder to have a bad time.

Care should be exercised when the judge is examining the wool about the shoulder or wither and on top to raise the head a little, push it back gently, so as to cause the wool to appear to be dense. In this position the judge can satisfy himself as to the value or merit of the respective points, excepting the under part. The sheep should then be turned up so as to expose the belly, legs, front, and brisket. To the average holder this is the most difficult part of his task, requiring tact, together with the assistance of a little strength when necessary.

HOW TO OPEN THE WOOL WHEN EXAMINING THE SHEEP.

The main object when inspecting wool on the sheep is to open it without crushing the staples, and at the same time to expose it so as to allow a thorough inspection as to type and quality. There are many people who cannot open and inspect the wool properly. The general fault is that, instead of opening up the wool with the fingers, they dig them into the fleece, crushing the staples in all directions, so as to make it impossible for the wool to show in its most natural state. When opening up the fleece guard against pressure being brought to bear on the wool. Use the thumb and first and second fingers of both hands as spreaders; this is done by dividing the wool, not pressing, but opening out, keeping the staples straight whilst laying them down. Any stretching should be avoided, but when the wool is open it should be allowed to rest in its natural position. The wool can then be thoroughly inspected. When released after inspection the wool will close without having any crushed or pressed appearance. When examining the sides and when standing well over the sheep, the wool is required to be opened right from back to belly.

HOW TO TURN UP A SHEEP.

When a holder is required to turn up a sheep he should take his place on the near side, retaining hold of the horn with the left hand until the animal is quiet. The next move is to place the left hand well round, and under the throat, then, with the right hand, take hold of the near hind leg, lift gently in a direct line with the side of the sheep, neither pulling nor pushing it to or from him, but straight. The hind leg now being close to the side, lift the front of the sheep, and in so doing let it go gently on its near thigh or rump, where it will fall into its position between the legs of the holder. In this position the judge can examine every point with satisfaction to himself. When the sheep is not under examination the holder should slightly turn it on one side where it will rest more contentedly.

When judging sheep constitution, frame, robustness, trueness of type, evenness of covering, density, breeding, and quality have to be taken into consideration.

WOOL GROWERS' READY RECKONER.

SHOWING REDUCTIONS OF CWTS., ETC., TO LBS., FROM 1 TO 5½ CWTS.

Wool is now weighed in lbs. instead of cwt. qrs., and lbs.

cwt.	qrs.	lbs.	lbs.	cwt.	qrs.	lbs.	lbs.	cwt.	qrs.	lbs.	lbs.	cwt.	qrs.	lbs.	lbs.	cwt.	qrs.	lbs.	lbs.	cwt.	qrs.	lbs.	lbs.	cwt.	qrs.	lbs.	lbs.	cwt.	qrs.	lbs.	lbs.
1	**0**	**0**	**112**																												
1	0	1	113	1	2	1	169	2	0	1	225	2	2	1	281	3	0	1	337	3	2	1	393	4	0	1	449	4	2	1	505	5	0	1	561
1	0	2	114	1	2	2	170	2	0	2	226	2	2	2	282	3	0	2	338	3	2	2	394	4	0	2	450	4	2	2	506	5	0	2	562
1	0	3	115	1	2	3	171	2	0	3	227	2	2	3	283	3	0	3	339	3	2	3	395	4	0	3	451	4	2	3	507	5	0	3	363
1	0	4	116	1	2	4	172	2	0	4	228	2	2	4	284	3	0	4	340	3	2	4	396	4	0	4	452	4	2	4	508	5	0	4	564
1	0	5	117	1	2	5	173	2	0	5	229	2	2	5	285	3	0	5	341	3	2	5	397	4	0	5	453	4	2	5	509	5	0	5	565
1	0	6	118	1	2	6	174	2	0	6	230	2	2	6	286	3	0	6	342	3	2	6	398	4	0	6	454	4	2	6	510	5	0	6	566
1	0	7	119	1	2	7	175	2	0	7	231	2	2	7	287	3	0	7	343	3	2	7	399	4	0	7	455	4	2	7	511	5	0	7	567
1	0	8	120	1	2	8	176	2	0	8	232	2	2	8	288	3	0	8	344	3	2	8	400	4	0	8	456	4	2	8	512	5	0	8	568
1	0	9	121	1	2	9	177	2	0	9	233	2	2	9	289	3	0	9	345	3	2	9	401	4	0	9	457	4	2	9	513	5	0	9	569
1	0	10	122	1	2	10	178	2	0	10	234	2	2	10	290	3	0	10	346	3	2	10	402	4	0	10	458	4	2	10	514	5	0	10	570
1	0	11	123	1	2	11	179	2	0	11	235	2	2	11	291	3	0	11	347	3	2	11	403	4	0	11	459	4	2	11	515	5	0	11	571
1	0	12	124	1	2	12	180	2	0	12	236	2	2	12	292	3	0	12	348	3	2	12	404	4	0	12	460	4	2	12	516	5	0	12	572
1	0	13	125	1	2	13	181	2	0	13	237	2	2	13	293	3	0	13	349	3	2	13	405	4	0	13	461	4	2	13	517	5	0	13	573
1	0	14	128	1	2	14	182	2	0	14	238	2	2	14	294	3	0	14	350	3	2	14	406	4	0	14	462	4	2	14	518	5	0	14	574
1	0	15	127	1	2	15	183	2	0	15	239	2	2	15	295	3	0	15	351	3	2	15	407	4	0	15	463	4	2	15	319	5	0	15	575
1	0	16	128	1	2	16	184	2	0	16	240	2	2	16	296	3	0	16	352	3	2	16	408	4	0	16	464	4	2	16	520	5	0	16	576
1	0	17	129	1	2	17	185	2	0	17	241	2	2	17	297	3	0	17	353	3	2	17	409	4	0	17	465	4	2	17	521	5	0	17	577
1	0	18	130	1	2	18	186	2	0	18	242	2	2	18	298	3	0	18	354	3	2	18	410	4	0	18	466	4	2	18	522	5	0	18	578
1	0	19	131	1	2	19	187	2	0	19	243	2	2	19	299	3	0	19	355	3	2	19	411	4	0	19	467	4	2	19	523	5	0	19	579
1	0	20	132	1	2	20	188	2	0	20	244	2	2	20	300	3	0	20	356	3	2	20	412	4	0	20	468	4	2	20	524	5	0	20	580
1	0	21	133	1	2	21	189	2	0	21	245	2	2	21	301	3	0	21	357	3	2	21	413	4	0	21	469	4	2	21	525	5	0	21	581
1	0	22	134	1	2	22	190	2	0	22	246	2	2	22	302	3	0	22	358	3	2	22	414	4	0	22	470	4	2	22	526	5	0	22	582
1	0	23	135	1	2	23	191	2	0	23	247	2	2	23	303	3	0	23	359	3	2	23	415	4	0	23	671	4	2	23	527	5	0	23	583
1	0	24	136	1	2	24	192	2	0	24	248	2	2	24	304	3	0	24	360	3	2	24	416	4	0	24	472	4	2	24	528	5	0	24	584
1	0	25	137	1	2	25	193	2	0	25	249	2	2	25	305	3	0	25	361	3	2	25	417	4	0	25	473	4	2	25	529	5	0	25	585
1	0	26	138	1	2	26	194	2	0	26	250	2	2	26	306	3	0	26	362	3	2	26	418	4	0	26	474	4	2	26	530	5	0	26	586
1	0	27	139	1	2	27	195	2	0	27	251	2	2	27	307	3	0	27	363	3	2	27	419	4	0	27	475	4	2	27	531	5	0	27	587
1	**1**	**0**	**140**	**1**	**3**	**0**	**196**	**2**	**1**	**0**	**252**	**2**	**3**	**0**	**308**	**3**	**1**	**0**	**364**	**3**	**3**	**0**	**420**	**4**	**1**	**0**	**476**	**4**	**3**	**0**	**532**	**5**	**1**	**0**	**588**

1	1	1	141	1	3	1	197	2	1	1	253	2	3	1	309	3	1	1	365	3	3	1	421	4	1	1	477	4	3	1	533	5	1	1	589
1	1	2	142	1	3	2	198	2	1	2	254	2	3	2	310	3	1	2	366	3	3	2	422	4	1	2	478	4	3	2	534	5	1	2	590
1	1	3	143	1	3	3	199	2	1	3	255	2	3	3	311	3	1	3	367	3	3	3	423	4	1	3	479	4	3	3	535	5	1	3	591
1	1	4	144	1	3	4	200	2	1	4	256	2	3	4	312	3	1	4	368	3	3	4	424	4	1	4	480	4	3	4	536	5	1	4	592
1	1	5	145	1	3	5	201	2	1	5	257	2	3	5	313	3	1	5	369	3	3	5	425	4	1	5	481	4	3	5	537	5	1	5	593
1	1	6	146	1	3	6	202	2	1	6	258	2	3	6	314	3	1	6	370	3	3	6	426	4	1	6	482	4	3	6	538	5	1	6	594
1	1	7	147	1	3	7	203	2	1	7	259	2	3	7	315	3	1	7	371	3	3	7	427	4	1	7	483	4	3	7	539	5	1	7	595
1	1	8	148	1	3	8	204	2	1	8	260	2	3	8	316	3	1	8	372	3	3	8	428	4	1	8	484	4	3	8	540	5	1	8	596
1	1	9	149	1	3	9	205	2	1	9	261	2	3	9	317	3	1	9	373	3	3	9	429	4	1	9	485	4	3	9	541	5	1	9	597
1	1	10	150	1	3	10	206	2	1	10	262	2	3	10	318	3	1	10	374	3	3	10	430	4	1	10	486	4	3	10	542	5	1	10	598
1	1	11	151	1	3	11	207	2	1	11	263	2	3	11	319	3	1	11	375	3	3	11	431	4	1	11	487	4	3	11	543	5	1	11	599
1	1	12	152	1	3	12	208	2	1	12	264	2	3	12	320	3	1	12	376	3	3	12	432	4	1	12	488	4	3	12	544	5	1	12	600
1	1	13	153	1	3	13	209	2	1	13	265	2	3	13	321	3	1	13	377	3	3	13	433	4	1	13	489	4	3	13	545	5	1	13	601
1	1	14	154	1	3	14	210	2	1	14	266	2	3	14	322	3	1	14	378	3	3	14	434	4	1	14	490	4	3	14	546	5	1	14	602
1	1	15	155	1	3	15	211	2	1	15	267	2	3	15	323	3	1	15	379	3	3	15	435	4	1	15	491	4	3	15	547	5	1	15	603
1	1	16	156	1	3	16	212	2	1	16	268	2	3	16	324	3	1	16	380	3	3	16	436	4	1	16	492	4	3	16	548	5	1	16	604
1	1	17	157	1	3	17	213	2	1	17	269	2	3	17	325	3	1	17	381	3	3	17	437	4	1	17	493	4	3	17	549	5	1	17	605
1	1	18	158	1	3	18	214	2	1	18	270	2	3	18	326	3	1	18	382	3	3	18	438	4	1	18	494	4	3	18	550	5	1	18	606
1	1	19	159	1	3	19	215	2	1	19	271	2	3	19	327	3	1	19	383	3	3	19	439	4	1	19	495	4	3	19	551	5	1	19	407
1	1	20	160	1	3	20	216	2	1	20	272	2	3	20	328	3	1	20	384	3	3	20	440	4	1	20	496	4	3	20	552	5	1	20	608
1	1	21	161	1	3	21	217	2	1	21	273	2	3	21	329	3	1	21	385	3	3	21	441	4	1	21	497	4	3	21	553	5	1	21	609
1	1	22	162	1	3	22	218	2	1	22	274	2	3	22	330	3	1	22	386	3	3	22	442	4	1	22	498	4	3	22	554	5	1	22	610
1	1	23	163	1	3	23	219	2	1	23	275	2	3	23	331	3	1	23	387	3	3	23	443	4	1	23	499	4	3	23	555	5	1	23	611
1	1	44	164	1	3	24	220	2	1	24	276	2	3	24	332	3	1	24	388	3	3	24	444	4	1	24	500	4	3	24	556	5	1	24	612
1	1	25	165	1	3	25	221	2	1	25	277	2	3	25	333	3	1	25	389	3	3	25	445	4	1	25	501	4	3	25	557	5	1	25	613
1	1	26	166	1	3	26	222	2	1	26	278	2	3	26	334	3	1	26	390	3	3	26	446	4	1	26	502	4	3	26	558	5	1	26	614
1	1	27	167	1	3	27	223	2	1	27	279	2	3	27	335	3	1	27	391	3	3	27	447	4	1	27	503	4	3	27	559	5	1	27	615
1	2	0	168	2	0	0	224	2	2	0	280	3	0	0	336	3	2	0	392	4	0	0	448	4	2	0	504	5	0	0	560	5	2	0	616

SOME NOTES ON GRAIN SORGHUMS.

W. M. CARNE,
Botanist and Plant Pathologist.

Maize, that valuable summer-growing forage and grain crop, requires a considerable amount of moisture and preferably a rich soil for successful growth. These facts has to a large extent confined its use to soils which remain moist in the summer, or to those portions of the South-West which receive a reliable summer rainfall. The limited acreage cultivated is required for forage purposes, particularly for dairy cows, so that there is little commercial production of grain.

The object of these notes is to draw attention to another summer-growing grain crop, which is less exacting in its requirements, and which offers considerable possibilities as a source of grain, and also of forage for livestock, including poultry. The crop referred to is that of the grain sorghums, particularly the varieties known as Milo Maize and Feterita and Kafir Corn. Grain Sorghums will grow successfully on poorer land and with less moisture than maize. It is not claimed that they are equal to maize where the latter thrives, but that they will do better where the conditions are less favourable. They will produce heavy crops of green forage readily eaten by stock, though it is not as palatable as maize or the sweet sorghums, such as Planter's Friend and Amber Cane. Further, if allowed to mature, they will produce crops of grain where maize fails to do so, and nearly equal to it in feeding value. Such a crop may be utilised by poultry farmers to supplement the usual grains, which owing to high prices, often seriously affect their financial returns.

While it is unsafe to predict the future of a crop new to the State, there is every justification for small trials of grain sorghum in the metropolitan, south-west and great southern districts for green forage. As a grain crop it is well worth the attention of poultry farmers.

Grain sorghums differ from sweet sorghums in being free from the sugary juices of the latter, in being more hardy, and in producing valuable grain crops. They differ from maize in being hardier, and in producing grain crops where maize fails to do so. They are usually shorter in growth. The grain is small and is borne in dense compact bunches at the top of the stalk and not on cobs. They are not readily affected by hot winds when flowering, a frequent cause of bad cobbing in maize. They are also less affected by the presence of small amounts of salt in the soil.

The grain is almost equal to maize in feeding value. It may be fed to all classes of stock, preferably after being crushed or cracked. It is fed to poultry after crushing, and is used with the morning mash in proportions up to 10 per cent.

As forage the plant can be used green, but should be allowed to wilt, if cut before flowering, by allowing it to remain in the sun for a day. This is a precaution against sorghum poisoning. There is no danger after the plants have headed. If cut when the grain is in the firm dough state, it should be tied into bundles and stooked until dry. It may be fed whole, but there is less waste if it is chaffed or shredded.

Under different names such as Kaoliang, Kafir Corn, and Dhurra grain sorghums are grown for human food in various parts of the world, but especially in Africa, both North and South, and in China.

As fodder and grain for feeding stock they are used not only in Africa and China, but also in the drier parts of the Great Plains area of the United States, in some States (as in Oklahoma) constituting one of the major crops.

Kafir Corn grown at Australind.

Little attention has been given to them in Australia, and most farmers know little or nothing of the crop. At Nyngan Experiment Farm in New South Wales, beyond the safe wheat belt line, their value has been demonstrated

for sheep feeding, and they have been successfully grown on various experiment farms in that State. Under irrigation at the Murrumbidgee Irrigation Area at Yanco, and under bore irrigation at Coonamble, they have done remarkably well. At Yanco yields of over 100 bushels of grain per acre have been obtained as against about 20 from maize.

When on the Palestine coastal plain, which has a climate very similar to that of the agricultural belt of Western Australia, the writer was struck with the wonderful hardiness of a variety of Dhurra (probably Feterita), which, sown at the end of the rainy season (spring) grew to about four feet, and matured a good crop of grain without any rain during its growth.

There are many varieties of grain sorghums, but those which promise to be of the most use here are Milo, Feterita, and Kafir Corn. Kafir Corn produces the greatest bulk of forage of these three, but takes longer to mature. As a grain yielder it is less reliable than Milo or Feterita, and usually gives a lighter crop. Grain is matured in about 115 days. It grows to about six feet. Milo is the most reliable grain copper of the three. It is hardier than Kafir, and matures grain in about 105 days, growing to about five feet. It comes next to Kafir Corn in forage yield. Feterita comes away more slowly in the spring, but matures grain in about 95 days. Its grain yield is very similar to that of Milo. Height about four feet.

For green forage on soils with summer moisture Kafir Corn is worth trying in contrast with maize, where maize is only partially successful. For all round purposes, however, Milo is the most promising for trial where maize cannot be grown. Under dry conditions it will produce as much forage as Kafir Corn, and heavier crops of grain. Both Milo and Feterita may be expected to produce anything from 10 to 40 bushels of grain per acre under suitable conditions.

Cultural Notes.—Grain sorghums should be sown about the end of September or early in October. Feterita in particular requires a fairly warm soil, and may require to be sown later if the spring is mild. In the South-West late October sowings would probably be best. The seed should be sown in drills about three feet apart at the rate of 5lbs. per acre. The use of a maize dropper with a sorghum seed plate is preferable to the seed drill. Superphosphate should be used at the rate of 70 to 100 lbs. per acre. Weeds must be kept down by cultivation. For forage the crop may be cut by hand, or with reaper and binder. It should not be grazed until it has headed. If harvested for grain the stalks can then be fed as roughage. For grain the heads are usually harvested by hand, though they have been successfully harvested with a reaper-header at Cowra, New South Wales. By setting the drum as low as possible the grain is taken off well with little cracked seed. Stock may then be turned on to the stubble. The crop is sometimes cut with a reaper and binder, and stooked in the field until the grain is quite dry. The heads are then cut off with stems about one foot long, and fed into a grain thresher or harvester set up as a thresher adjusting so as to secure as little cracked grain as possible. If harvested by hand the grain may be removed from the heads with a home-made hackler, or with a flail. The grain should be thoroughly dry before storage or it may heat. If in bins it should not be more than two to three feet deep. When cut by hand the grain may be stored in the head and threshed as required. The bushel weight is about 56 to 58 lbs.

Seed for Distribution.—A limited quantity of seed of Milo is available for distribution in small parcels on application to the Department of Agriculture, Perth.

Heads of Kafir Corn.

FERTILISERS (continued).

By G. N. Lowe,
Senior Potato Inspector.

Potash.—This portion of the potato manure has, primarily due to its being unobtainable during the war period, been neglected largely, and a mixture of superphosphate and sulphate of ammonia only used.

It must be admitted that the return per acre has not suffered because of this non-inclusion of potash, although it is certainly evident that the keeping qualities of tubers grown in the older localities are not what they were and even more noticeably lacking is the culinary quality.

The probability is that the absence of potash in the fertilisers is largely responsible for this deficiency, although in our heavy soils the potash naturally available is sufficient for the requirements of the crop from the tonnage standpoint. It is hoped that the fertiliser experiments now being conducted, and in which potash is being used, may throw light on this feature of the quality of our potatoes.

It is well to remember, however, that the variety which is almost solely grown in this State, viz., the "Delaware," is a "first early" as to length of the growing period, and, being such a quick maturer, it is not to be expected that the starch content—and this is what the cook values in the potato—can be as high as in, say, the "Factor," which takes another six weeks in growth and the business of starch formation.

It is interesting to note the difference in "early" and "late" varieties of tubers, when cut lengthwise, when referring to the starch content of tubers.

Ripe specimens of each should be cut and compared, and it will be at once noticeable that the "early" variety will show semi-transparent streaks radiating from the centre and also a similar appearance around near the edges, under the skin. The intervening areas appear whiter and duller, this condition denoting a higher percentage of starch. "Late," *i.e.*, long-growing, slow maturing, varieties show this white opaqueness throughout with a consequently greater starch value.

In countries where potatoes are grown for industrial purposes, special attention is given to the varieties yielding a high percentage of starch being purchased according to their worth in this particular.

Experiments carried out some years ago in America with 30 varieties of potatoes grown there, demonstrated that the average starch content was 14.3 per cent. The richest in starch was the "Burbank," showing 17.7 per cent., and the lowest a kidney variety. Our own "Delaware" averages about 14 per cent., but is influenced, as are all potatoes, by the soil, methods of cultivation, and depth of planting. Deep planting and hilling, it is claimed, tend to a reduction in starch production.

Potatoes for manufacturing purposes are not grown in this State, although in Victoria a small factory has been erected with a view to using

undersized and reject tubers. At Kendenup dehydration of potatoes has been employed and the product has been particularly suitable for use on out-back stations and in localities where the fresh tuber is hard to obtain and harder to keep.

In Western Australia, where no facilities exist for the conversion of small and reject produce, growers are much better advised to cull all such out of their lines for table purposes and turn them into pork.

The extent to which this class of stuff operates against top prices when included in a consignment is not realised by the bulk of potato growers, and far greater attention can profitably be directed to this phase of the business.

The argument is often advanced that the good sells the bad, but the truth is the bad condemns the best.

With the cost of producing potatoes at its present level, it is unlikely that the manufacture of starch and alcohol from potatoes in Australia will be embarked upon. Even in glut seasons growers would not be over eager to accept 30s. per ton for their crops for this purpose, and this is the top rate in continental countries, and a continuity of supplies is, of course, a first consideration in an industrial venture.

CULTURAL NOTES.

With the earlier planted crops now appearing above ground, top-dressing, where followed, should not be delayed, particularly with the indications pointing to a distinct falling off in normal rains.

Harrowing should follow at once and the spike tooth cultivator kept busy as soon as the rows are discernible, to keep down weeds and conserve moisture.

As the crop progresses a watchful eye must be kept for any plants not true to type and variety, and these culled rigidly.

METEOROLOGICAL INFORMATION.

1925.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	JUNE, 1925.						JULY, 1925.						AUGUST, 1925.					
					inches.	inches.					inches.	inches.					inches.	inches.
Chapman Farm State	68·9	80·9	48·0	40·5	7·48	3·93	64·6	72·3	44·1	35·1	3·24	3·93	68·1	74·1	43·8	35·3	1·06	2·81
Geraldton	71·1	80·6	54·3	44·7	6·82	4·71	66·8	73·8	50·4	39·9	3·62	3·90	70·0	77·3	49·6	42·6	1·33	3·00
Walebing	64·4	78·2	44·1	32·0	3·39	3·96	59·8	66·0	38·9	31·0	4·08	3·59	...	...	...	...	...	3·10
Perth	66·0	78·3	50·0	42·0	8·50	6·90	62·1	69·0	45·1	37·0	6·89	6·44	64·1	72·0	45·6	38·4	1·90	5·70
Kalamunda	67·2	80·0	50·9	43·5	6·69	8·09	62·8	74·0	44·7	39·0	7·54	7·72	63·8	69·7	42·5	37·0	1·63	6·97
Bunbury	65·0	75·8	48·5	37·2	6·08	7·21	62·0	66·8	45·5	36·8	8·98	6·91	64·3	71·2	44·7	37·2	1·72	5·52
Bridgetown	62·4	74·9	39·8	32·0	3·70	5·89	58·8	65·0	38·2	30·5	4·84	5·73	61·9	69·0	36·0	26·5	1·31	5·19
Albany	62·8	75·0	48·0	41·0	4·44	5·53	59·6	65·4	45·7	36·0	4·73	5·46	59·7	67·6	45·4	38·0	1·98	5·29
Merredin Farm State	63·7	77·3	43·0	32·2	1·47	1·85	59·3	65·6	35·8	29·4	1·34	1·96	...	...	37·9	28·2	1·83	1·55
Northam	65·2	79·1	43·7	34·5	3·35	3·30	60·2	66·5	36·9	31·9	2·44	3·34	62·3	70·7	38·2	32·2	0·26	2·64
York	65·0	76·8	45·7	33·0	3·30	3·37	60·6	66·0	38·0	30·2	2·41	3·26	63·9	70·2	37·9	31·0	0·41	2·91
Narrogin Farm State	61·2	73·5	43·4	33·3	2·03	3·72	57·5	62·0	38·9	30·8	2·68	4·01	59·8	67·0	38·1	30·8	0·83	3·34
Katanning	60·9	74·0	42·4	33·5	2·49	2·87	56·9	61·3	40·0	30·0	2·12	2·96	58·9	65·0	37·9	28·1	1·54	2·56
Cape Leeuwin ...	63·1	71·5	54·0	46·5	4·73	6·91	60·7	64·2	51·6	47·0	5·99	7·12	61·1	69·0	50·6	44·0	2·22	5·30

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith, & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK AT METROPOLITAN FAT STOCK MARKETS, DURING MONTHS OF JUNE, JULY, AND AUGUST, 1925.

	JUNE.				JULY.					AUGUST.			
	3.	10.	17.	24.	1.	8.	15.	22.	29.	5.	12.	19.	26.
Sheep and Lambs	6,018	6,894	6,827	6,680	4,719	7,482	6,967	7,535	8,082	7,800	8,062	9,414	5,741
Cattle ...	648	834	794	499	1,151	1,049	1,048	1,087	690	660	1,070	1,261	451
Pigs ...	661	741	604	544	799	580	512	746	661	453	785	516	783

COMPARATIVE VALUES OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS, DURING MONTHS OF JUNE, JULY, AND AUGUST, 1925.

	JUNE.				JULY.					AUGUST.			
	3.	10.	17.	24.	1.	8.	15.	22.	29.	5.	12.	19.	26.
Mutton	11	10¾	10½	10½	10½	10½	10¾	10½	10	10	10	9	10
Beef ...	8	7½	6½	6¼	6	5½	5½	6	6½	7	6½	6	6½
Pork ...	11¾	12	12	11½	11¾	11¾	12	12	12	12½	12¾	12¾	11½
Bacon ...	10	9	9	8½	8½	8½	9½	9½	9½	9½	10	10	10

MARKET REPORT.

Chaff.—Hereunder are detailed particulars of the approximate quantity of both wheaten and oaten chaff available for auction at the metropolitan chaff and grain auction sales held in Perth during the months of June, July, and August, also the minimum and maximum prices ruling for f.a.q. to prime wheaten chaff during those months:—

June—Quantity, 2,350 tons.
Minimum price for f.a.q. to prime, £6 5s. per ton.
Maximum price for f.a.q. to prime, £6 17s. 6d. per ton.

July—Quantity, 2,850 tons.
Minimum price for f.a.q. to prime, £6 5s. per ton.
Maximum price for f.a.q. to prime, £7 2s. 6d. per ton.

August—Quantity, 1,900 tons.
Minimum price for f.a.q. to prime, £5 15s. per ton.
Maximum price for f.a.q. to prime, £7 per ton.

Wheaten Chaff.—For the three months preceding June, the total quantity of chaff available in Perth was 8,550 tons against 7,100 tons for the last three months. The quantities received in June and July were up to normal, but it will be seen that supplies in August diminished considerably. This is accounted for mostly by the dry weather conditions experienced, farmers being very reluctant to market their surplus. During the last few days the market has firmed considerably, and up to £7 15s. per ton has been secured for prime samples. At time of writing this report (9-9-25) a little rain has fallen with indications of a good downpour setting in. The chaff market is still firm, but, of course, if the country is benefited with good rains it may have a slight easing tendency. However, it will yet be some time before the new hay is cut, and as there appears to be very little surplus of hay and chaff now held there is every likelihood of prices remaining satisfactory.

Oaten Chaff.—Although supplies were fairly plentiful during the months of June and July, in August supplies dwindled, and at the beginning of this month oaten chaff has been indeed very hard to procure. Consignments of f.a.q. arriving on this market during the last few days have realised £6 10s. per ton, and there is an excellent demand for all qualities, good mediums being worth £6 5s., and mediums, suitable for cow feed, £5 15s. to £6 per ton.

Oats.—Supplies during June and July were very plentiful, and, as predicted, the market eased, good heavy feeds being sold as low as 2s. 3d. per bushel. Owing to the dry spell experienced during August farmers ceased marketing. The result was that the market firmed, and at the time of writing good heavy feeds are worth 2s. 10½d. per bushel on the Perth market, and mediums 2s. 9d. to 2s. 9½d. We believe that stocks of oats held are heavy, and no doubt if good rains are experienced farmers will be inclined to market, and then, of course, values will be almost certain to ease.

Wheat.—The market is firm. Supplies arriving in Perth for sale at auction are meeting with ready sale, f.a.q. selling at from 6s. 4½d. to 6s. 5½d. per bushel. We should strongly advise farmers having any surplus to dispose of to consign to Perth for sale at auction.

Groupers landing at Fremantle.

WESTERN AUSTRALIA—DEPARTMENT OF AGRICULTURE.

List of Bulletins available for Distribution.

No. 20.—*The Pruning of Fruit Trees.* By J. F. Moody. Price 2s. 6d.
No. 46.—*Fruit Packing and Marketing and Exporting of Fruit.* By J. F. Moody and J. Ramage. Price 1s. 6d.
No. 47.—*The Poultry Keeper's Manual.* By G. Allman. Price 1s.
No. 83.—*Horticulture and Viticulture.* By A. Despeissis. Price 2s.
No. 5.—*Fruit Drying.* By J. F. Moody. Free.
No. 15.—*Root Rot.* By A. J. Despeissis. Free.
No. 49.—*The Feeding of Horses.* By Professor Paterson and G. L. Sutton. Free.
No. 57.—*Vermin Destruction.* By A. Crawford. Free.
No. 60.—*The Farmer's Clip.* By J. J. Mahood. Free.
No. 68.—*Flaying and Treatment of Hides.* By R. E. Weir. Free.
No. 72.—*The Potato: Its Cultivation, Pests, and Diseases.* By G. N. Lowe, L. J. Newman, D. A. Herbert. Free.
No. 74.—*Tobacco Growing: Notes for Intending Planters.* By G. W. Wickens. Free.
No. 79.—*Sheep on the Wheat Farm and their Management in W.A.* By H. McCallum. Free.
No. 87.—*Sheep Feeding Experiments: State Farm, Chapman,* 1920. By G. L. Sutton and F. Vanzetti. Free.
No. 88.—*Light Land: Conference.* By G. L. Sutton. Free.
No. 90.—*Stock Waters: Standard for Composition of.* By E. A. Mann. Free.
No. 93.—*The Home Tanning of Sheep and other Skins.* By H. Salt. Free.
No. 94.—*The Dingo.* By B. W. Leake. Free.
No. 96.—*Poison Plants of W.A.* By D. A. Herbert. Free.
No. 99.—*Australian White.* By G. L. Sutton. Free.
No. 101.—*Cotton Cultivation.* By G. L. Sutton. Free.
No. 103.—*Kerosene Method for Eradicating the Zamia Palm.* By G. K. Baron-Hay. Free.
No. 104.—*Stickfast Flea.* By J. G. C. Campbell. Free.
No. 105.—*Pedigree Selection of Seed.* By G. L. Sutton. Free.
No. 106.—*The Red Legged Velvet Earth Mite.* By L. J. Newman. Free.
No. 107.—*Sudan Grass.* By G. L. Sutton. Free.
No. 109.—*Rape* By G. L. Sutton. Free.
No. 111.—*Standard Wheat Varieties.* By G. L. Sutton and F. Vanzetti. Free.
No. 112.—*Automatic Device for Eradication of Stickfast Flea.* By G. Allman. Free.
No. 113.—*Picked Pieces (Classification of Clip).* Free.
No. 114.—*Blue Mould on Citrus Fruits.* By W. M. Carne. Free.
No. 115.—*The Value of Windmills for Pumping Water in W.A.* A. H. Scott.
No. 116.—*Spotted Wilt of Tomatoes.* W. M. Carne.
No. 117.—*Cream.* P. G. Hampshire.
No. 118.—*Pigs and Pig Raising.* P. G. Hampshire.
No. 119.—*Take-all of Wheat and Similar Diseases of Cereals.* By W. M. Carne and J. G. C. Campbell.
No. 120.—*Pastures in the South-West.* A. B. Adams. (Reprint from "Journal.")
No. 121.—*Mildew, Septoria, Leaf Spots, and Similar Diseases of Cereals.* W. M. Carne and J. G. C. Campbell.
No. 122.—*Fruit Fly. Description and Control.* L. J. Newman.
No. 124.—*Government Inspection of Wheat.* G. K. Baron-Hay. (Reprint from "Journal.")
No. 125.—*Buy Good Seed.* (Advice to Farmers.) W. M. Carne. (Reprint from "Journal.")
No. 126.—*The Rust of Cereals.* W. M. Carne and J. G. C. Campbell.
No. 127.—*Wheat Yields—Competitions.*
No. 128.—*Woolly Aphis Parasite (Aphelinus mali).* (Hald.) L. J. Newman. (Reprint from "Journal.")
No. 129.—*The Farm Horse: Hints on Feeding.* A. McK. Clark. (Reprint from "Journal.")
No. 130.—*Minerals and the Health of Cattle.* A. B. Adams. (Reprint from "Journal.")
No. 131.—*The Strength of Wheat and Flour.* R. G. Lapsley. (Reprint from "Journal.")
No. 133.—*Kikuyu Grass for Poultry.* G. L. Sutton. (Reprint from "Journal.")
No 134.—*Flag Smut of Wheat.* W. M. Carne. (Reprint from "Journal.")
No. 135.—*The Objects of Farmers' Trials.* G. L. Sutton. (Reprint from "Journal.")
No. 136.—*The use of the Scythe.* H. Campbell. (Reprint from "Journal.")
No. 137.—*Winter Trapping of the Fruit-fly.* L. J. Newman. (Reprint from "Journal.")
No. 138.—*Clearing Heavily-timbered Pastures.* A. B. Adams. (Reprint from "Journal.")
No. 140.—*Surface Draining.* A. R. Clifton. (Reprint from "Journal.")
No. 141.—*Breeding a Permanent Flock.* H. McCallum. (Reprint from "Journal.")
No. 142.—*The Plague Locust.* L. J. Newman. (Reprint from "Journal.")
No. 143.—*Zamia Palm and "Rickets" in Cattle—Method of Eradication.* A. B. Adams and G. K. Baron-Hay.

No. 144—*Ants as Pests.* J. Clark.
No. 145—*The Tuart Bud Weevil.* L. J. Newman and J. Clark.
No. 146—*Development of a Dairy Herd.* P. G. Hampshire.
No. 147—*Cultivation of the Potato.* G. N. Lowe.
No. 148—*Maize—The King of Fodder Crops.* G. L. Sutton.
No. 149—*Lucerne.* G. L. Sutton.
No. 150—*Subterranean Clover.* A. B. Adams.
No. 151—*Blow Fly Traps.* L. J. Newman.
No. 152—*Bee Diseases.* H. L. Cailes.
No. 153—*Lice and Tick in Sheep.* F. Murray-Jones, L. J. Newman, and H. McCallum.
No. 154—*Branding the Wool Bale.* G. L. Sutton and N. Davenport.
No. 155—*A simple Dry Pickler.* G. L. Throssell.

The following publications may be obtained from the Department of Agriculture, Perth, on application, or will be sent post free to any address in this State on receipt of a remittance for the amount stated :—

The Handbook of Horticulture and Viticulture of Western Australia, by A. Despessis, M.R.A.C.:
This publication contains valuable information dealing with all commercial fruits grown in Western Australia, including advice on planting, pruning, packing, manuring, fruit-drying, wine-making, insect and fungoid pests and their treatment, etc., and the whole forms a text book which every fruitgrower, whether large or small, should have in his possession. The price originally was 8s. 6d., but to allow of distribution being as wide as possible it has been reduced to 2s.

The Pruning of Fruit Trees, by J. F. Moody, Fruit Industries Commissioner:
This publication contains numerous illustrations, being reproduction of photographs taken in this State, of pruned and unpruned trees, which make the details set out in the letterpress particularly easy to understand. Price 2s. 6d.

Fruit Packing and the Marketing and Exporting of Fruit, by J. F. Moody, Fruit Industries Commissioner, and J. Ramage, Packing Instructor:
This publication contains invaluable information on packing and grading fruit for local and export markets. It is freely illustrated, and no fruit-packing shed should be without a copy. Price 1s. 6d.

The Poultry Keepers' Manual, by George Allman, Government Poultry Expert:
This is a most useful and valuable book, not only for beginners, but to all those who keep fowls for pleasure and profit. It deals fully with all matters connected with the industry, including Breeding, Feeding (for stock birds or egg production), Incubating, Brooding and care of chicks, Marketing (eggs and poultry), and all matters of use to the poultry-keeper. It also fully describes symptons of various ailments and diseases and simple treatment for same, and, as the book was written to suit *local conditions,* every poultry-keeper should have a copy by him. Price, 1s.

Agricultural Bank.

ADVANCES TO FARMERS.

The Agricultural Bank, which is a State institution and is worked under a Special Act, was founded with the object of making advances to settlers for the purpose of assisting and encouraging them during the early years of the development of their farm.

The Agricultural Bank makes advances on approved securities to approved persons engaged in the business of farming or grazing, or in horticultural pursuits, to an amount not exceeding £2,000.

Every application must be made on the prescribed form, and must contain full particulars of the purposes for which the advance is required.

Where an advance is approved for effecting improvements on the borrower's land, such advance is made by progress payments as the work progresses.

Developmental advances are usually made for clearing, fencing, ringbarking, and water supply, and are made to the full value of the work done after it has been inspected and certified to by a responsible officer. After a reasonable stage of development has been reached, and providing the general progress of the settler is considered satisfactory, limited assistance is granted towards building (maximum £250), and money is provided to assist in the purchase of stock and machinery, the maximum amount for this purpose, except in special cases, being £150.

Interest is charged at the rate of seven per cent. per annum, and repayment of principal extends over a period of 30 years, except in the case of stock or machinery advances which have a currency of eight years only.

The security required by the Bank is a first mortgage over the lands on which the advance is to be expended, and such lands may consist of:—

(a) Holdings in fee simple; or
(b) Holdings under Special Occupation Lease or Conditional Purchase from the Crown; or
(c) Homestead Farms; or
(d) Such other real or leasehold property as the Trustees may think fit.

Mortgages are prepared free of charge; but borrowers are required to pay the statutory costs of registration.

Interest only on the advances made is charged during the first 10 years, and repayment of the capital does not commence until the eleventh year.

Application may be for sums of £25, or any multiple thereof, not exceeding £2,000. Each application must be accompanied by a valuation fee of one per cent of the amount applied for No refund of fee is allowed after an inspection of the security has been made.

The leases, or Occupation Certificate, as the case may be, together with the fees, must be in the possession of the Bank before a mortgage can be prepared.

REGISTRATION FEES.

	s.	d.
For each Conditional Purchase, Homestead Farm, or Grazing Lease under the Land Act	5	0
For each Freehold Lot or Crown Lease	10	0
For every additional Freehold Lot or Crown Lease	2	0

STAMP DUTY.

	s.	d.		s.	d.
Up to £50	1	3	From £301 to £400	10	0
From £51 to £100	2	6	„ £400 „ £500	12	6
„ £101 „ £150	3	9	Stock Bill of Sale, up to £50	5	0
„ £151 „ £200	5	0	„ „ over £50	10	0
„ £201 „ £250	6	3	Machinery Bill of Sale, up to £50	5	0
„ £251 „ £300	7	6	„ „ „ over £50	10	0

Intending borrowers are requested to note that no advances are made against improvements effected prior to date of application. Applications should, in every instance, be lodged prior to commencement of work, and moneys are then paid over in progress payments as the work proceeds.

IMPROVED FARMS.

The Trustees of the Agricultural Bank have, from time to time, improved farms on their hands which have been abandoned for various causes, or have been taken over as security for loans. These farms are available for purchase, and extended terms are given for payment of the amount. They often offer to intending settlers an opportunity of obtaining an improved holding, ready for occupation, at a cheap rate, without having to undertake the preliminary work of clearing and fencing. The properties, when obtainable, are advertised in the "Government Gazette"; but anyone wishing for particulars of such farms as may be available should make application to the Managing Trustee of the Agricultural Bank. Particulars will then be sent, and an inspection can be made by the intending settler to ascertain whether the same is suitable for his requirements.